AUDIT OF COUNTY CAPITAL PROJECT MANAGEMENT (Road Maintenance Program, Fiscal Year 2006-07, Phase I)

Submitted by

Office of the County Auditor
County of Kaua'i
State of Hawai'i

Report No. 12-02

PREFACE

This audit is one of three audits to assess whether the county is acting efficiently and effectively in performing capital project management duties. The other audits were:

- Audit of the Kaiākea Fire Station construction project
- Follow up audit of implementation of audit recommendations by the Department of Public Works, Building Division

The current audit studies whether the county has adequate personnel, processes, and practices to adequately staff and manage its road maintenance capital project. The road maintenance program for the fiscal year 2006-07, Phase I, was used as a test project.

We would like to thank the Managing Director and the public works department for contributing time and data for this audit.

Ernesto G. Pasion, County Auditor

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This audit examined the road resurfacing project for the fiscal year 2006-07, Phase I, to obtain insight into the county's management of capital projects. The audit scope consisted of:

- Assessing the county's efficiency and effectiveness in the performance of capital project management duties by comparing the planning and execution of the test project to industry best practices; and
- Identifying recommendations for increased economy, efficiency and effectiveness.

The audit findings and recommendations are summarized as follows:

Finding 1: The planning and methodology for the test project were inadequate and did not conform to best practices.

Sub-finding 1.1: The road selection process was not based on industry best practices, which require an analytical assessment of road conditions and public needs. Because the roads division did not have sufficient data to analytically prioritize roads based on need and condition, road selection was subjective and nontransparent.

Recommendation (Sub-finding 1.1): The administration and the county council should provide sufficient resources to enable the roads division to develop an asset management plan, to be used as a rational basis for (1) selecting roads for the annual road resurfacing program and (2) setting priorities for other highway projects.

Sub-finding 1.2: The funding provided for the road maintenance program was not based on needs and priorities. The roads division is provided a road resurfacing funding allocation determined by the director of finance.

Recommendation (Sub-finding 1.2): Public works and the roads division should conduct an economic trade-off analysis to determine the estimated optimum amount to invest in roads to achieve the highest economic return. The administration, director of finance and the county council should base the funding for road maintenance projects on this analysis.

Sub-finding 1.3: The roads division did not have enough resources to plan, procure or begin the test project on time. Untimely execution increased road deterioration and may have increased project costs.

Recommendation (Sub-finding 1.3): We recommend that the county administration and county council continue to allocate resources necessary for the roads division to plan and execute timely annual road maintenance programs. The resources could include the funds needed to ensure an accurate pavement condition inventory, deploy an effective pavement management system and provide training for division employees. These measures will allow the division to use the pavement management system effectively and efficiently in planning road maintenance projects.

Sub-finding 1.4: The methodology for the test project was inadequate, since it was a formerly used resurfacing-only approach that did not consider road conditions or alternative methods or materials.

Recommendations (Sub-finding 1.4): We recommend that the division consider allowing for reconstruction as part of the road maintenance solicitation even if exact locations cannot be specified. The contractor can be required to complete reconstruction at the prices in the bid, rather than as negotiated at a later date. Once the county's pavement management system is fully functioning, the areas requiring reconstruction can be better identified and included specifically in the plans for bidding purposes at the correct location with set unit pricing.

We recommend the division consider basing its remedial road work on pavement conditions and selecting the appropriate material for the conditions based on a cost-benefit analysis.

Sub-finding 1.5: The division uses inadequate standard operating policies and procedures for project-related tasks, and needs support to accelerate its development of revised policies and procedures.

Recommendation (Sub-finding 1.5): We recommend that the administration and the county council provide sufficient resources to enable the roads division to complete its policy and standard operating procedures manual.

Finding 2. The county's management of the highway fund is not consistent with state and county restrictions.

Sub-finding 2.1: The county's road resurfacing program is a repair and maintenance project, and should not be categorized as a capital project under the county charter.

Recommendation (Sub-finding 2.1): We recommend that the administration and county council ensure that the island wide road resurfacing projects are categorized as required by the county charter, and that capital budget funds are used for permanent improvements and not repair and maintenance.

Sub-finding 2.2: The county's highway fund is comprised of monies subject to restrictions (such as fuel and vehicle weight taxes and public utility franchise fees). The funds are commingled, and used for various purposes, including non-highway purposes, so the county cannot ensure that the funds are being used as required by law.

Recommendations (Sub-finding 2.2): We recommend that the public works and finance departments amend their existing policies and procedures to include detailed policies on the administration and use of the highway fund to ensure compliance with state law restrictions on the use of fuel and vehicle weight taxes and public utility franchise fees.

We recommend the public works and finance departments develop a chart of accounts dedicated strictly to operations funded by the fuel and vehicle weight taxes and public utility franchise fees.

CHAPTER 1

Introduction

This audit examined the road resurfacing project for the fiscal year 2006-07, Phase I, to obtain insight into the county's management of capital projects.

Audit Scope

The audit scope consisted of:

- Assessing the county's efficiency and effectiveness in the performance of capital project management duties by comparing the planning and execution of the test project to industry best practices; and
- Identifying recommendations for increased economy, efficiency and effectiveness.

Audit Objectives and Methodology

The road resurfacing program for fiscal year 2006-07, Phase I was used as the test project.[1]

In order to achieve the audit objective of understanding and assessing the capital project implementation procedures and processes of the roads maintenance division through the test project, we:

> Interviewed key county employees involved in the road resurfacing process, including the deputy county engineer and public works staff, to gain an understanding of how the project was developed and executed.
>
> Reviewed and analyzed project files to gain further data on the execution of the test project.

In order to achieve the audit objective of identifying recommendations for increased economy, efficiency and effectiveness, we:

> Reviewed reports and studies related to road maintenance and industry best practices as recommended by trade organizations and the Federal Highway Administration (FHWA).

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[1] In audit planning, we determined that an appropriate test project would be the latest annual road resurfacing program completed. We initially considered the resurfacing program for fiscal year 2006-07 as a potential test project. However, Phase II of the project (repaving in the Kōloa and Waimea districts) had not been completed at the time the audit was planned, so the audit scope was limited to Phase I.

Compared the execution of the test project to industry standards and best practices to determine project effectiveness.

The primary fieldwork for the audit was conducted from October 2010 through February 2011. Fieldwork was reopened from October to March 2012 to review newly-discovered issues, especially issues about funding for road maintenance projects, including the test project.

The audit was conducted by staff from the county auditor's office, with assistance from an external engineering consultant with experience in capital project planning and implementation as well as road maintenance technology and standards.

This audit was conducted in accordance with the applicable Government Auditing Standards issued by the Comptroller General of the United States. The standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Based on the results of our review, we prepared specific issues and recommendations for improvement and transmitted them to the administration in a draft report.

General Information

Road Maintenance Program

The county's annual road maintenance program consists primarily of resurfacing selected roads in East Kaua'i (Phase I) and West Kaua'i (Phase II). The roads division may also initiate separate projects if roads need repair and are not on the resurfacing schedule.

The annual road resurfacing project for a fiscal year typically begins with the allocation of road resurfacing funds by the finance director. The public works department requests funding for the program based on the allocation. The county council appropriates funding for the program through a capital budget ordinance. The appropriated funding may be more or less than the department's request. After the funds are appropriated, the roads division submits a list of roads to be repaved to the Kaua'i County Council for its consideration. The list is created by the chief of the roads division, who visually inspects the roads and selects them. The roads chief then determines how many roads can be resurfaced with the funds appropriated. His estimates are based on his visual inspections and consultation with his field staff. The list is presented to the mayor, and then to the county council. Following council approval of the list, the roads division prepares the plans and the bid. The Purchasing Division of the Finance Department procures contractors,[2] and in the case of the test project, the Engineering Division of the public works department monitored the contractor's work.

Roads Maintenance Division

The Roads Maintenance Division (also called the roads division) of the Department of Public Works is responsible for executing capital projects involving county roads.[3]

The roads division's stated missions are to maintain county roadways in a manner that will safely convey vehicular and pedestrian traffic, maintain major drainage facilities and support other county departments with equipment and labor.[4] The division's programs related to roads include maintaining and repairing road pavements and shoulders and installing and maintaining traffic devices and markings. However, the annual road resurfacing program is customarily outsourced and the division did not have enough staff to maintain road shoulders at the time of the test project.

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[2] For fiscal year 2006-07, repaving work for Phase I was procured separately from Phase II.

[3] County of Kaua'i Annual Report Fiscal Year 2009-10, page XV-22.

[4] The division states that it supports the parks department and solid waste division on a regular basis, and other agencies on an as-needed basis. County of Kaua'i Annual Report Fiscal Year 2009-10, page XV-22.

In fiscal year 2006-07, the division estimated its jurisdiction included about 300 miles of county road, a figure close to the 275 miles reported in the division's latest (2010-11 fiscal year) annual report. The annual report also states that of the 275 miles, 235 miles are paved and 40 miles are unpaved.

As of April 11, 2011, the roads division was authorized approximately 99 permanent full-time equivalent (FTE) positions. Approximately 19 of the positions were designated for refuse collection. As of that date, the division had 12 vacant positions, or a 12 percent vacancy rate.

The Test Project - Road Maintenance Program (Fiscal Year 2006-07, Phase I)

The county council provided $2,000,000 in capital budget funds for island-wide resurfacing in the 2006-07 fiscal year through Ordinance No. B-2006-646, passed on May 31, 2006. The road resurfacing funds comprised approximately 92 percent of the $2,167,089 in new appropriations for highway fund capital projects.[5]

The test project involved resurfacing roads in the Hanalei, Kawaihau and Līhu'e districts. The list of the roads identified for resurfacing was sent to the county council on October 18, 2006 by the chief of the roads division. The work was projected to occur from September 22, 2006 to October 18, 2006.

The test project was advertised for bid through Invitation for Bid No. 2833 (IFB 2833), published in the Garden Island newspaper on April 9, 2007. A non-mandatory pre-bid conference was scheduled for April 24, 2007 for interested parties. Prior to submitting bids, bidders were required to provide written notice of their intention to bid, together with certification of a Hawai'i state contractor's General Engineering License Type A or Specialty License Type C-3 by May 4, 2007. The deadline for submitting sealed proposals was May 15, 2007.

On May 24, 2007, Niu Construction, Inc. received a notice that it had been awarded the test project.[6] Contract No. 7627, in the amount of $2,277,792, was negotiated and transmitted to the contractor on July 24, 2007. Niu Construction was issued a notice to proceed on August 4, 2008. The notice to proceed specified that work on the contract should begin on August 21, 2008, and that the contractor would have 62 working days to complete the contract. The contract completion date was November 20, 2008.

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[5] However, highway capital project funding is a small part of the county's overall capital project funding. For example, in fiscal year 2006-07, the total appropriation balance in the capital project fund after passage of the capital budget ordinance was $58,758,361. Of this amount, only $4,401,718, or seven percent, was designated for projects to maintain and repair roadways.

[6] On December 10, 2008, the county consented to Niu's request to assign the contract to Grace Pacific Corporation, which had acquired Niu.

The project experienced 28 days of rain delays and four days of delays due to machine breakdown. On January 12, 2009, the county engineer declared that as of December 29, 2008, the work under Contract No. 7627 had been completed and recommended formal acceptance of all work under the contract.

On April 9, 2009, the county issued contract modification no. 1, which authorized a payment of an additional $2,357 based on the "actual number of units incorporated into the finished project" versus the estimated contract quantities.

The following table summarizes the actual tonnage used for the test project, based on adjustments made in Amendment No. 1. The table also compares the actual tonnage used for each street or road to the estimated contract quantity as shown in IFB 2833 and the tonnage estimated for the test project at the time the road list was proposed to the county council.

COMPARISON OF ACTUAL AND PROJECTED TONNAGE

Road/Street	*Actual Tonnage (Credit/Debit)*[7]	*Contract Estimate*	*Estimate Provided to Council*
Kaikala Street	299 (-17)	316	302
Koma Street	46	46	44
Kaohe Road	223 (-27)	250	242
Wailapa Road	621 (-49)	670	700
Kanaele Road	971 (+40)	931	1280
Hauiki Road	1126 (-155)	1281	1742
Makana Road	405 (+40)	365	466
Hauaala Road	1249 (-17)	1266	1540
Makamaka Street	110	110	613
Kamoa Road	108 (+17)	91	71
Apana Road	40	40	78
Miulana Place	119 (+17)	102	82
Lokelani Road	551 (+63)	488	536
Nahele Place	55	55	40
Kiowai Place	78	78	64
Heamoi Place	81	81	68
Lala Road	769 (-44)	813	822
Haoa Street	0 (-152)[8]	152	187
Aukele Street	521 (+11)	510	449
Peleke Street	328 (+3)	325	341
Milikeleka Place	67	67	229
Kuena Road	66	66	80
Maona Road	117 (+43)	74	84
Hoohana Street	677 (+50)	627	554
Laulima Street	196 (+3)	193	706
Hoolepe Street	207 (+19)	188	230
Lawehana Street	975 (+228)	747	902
Hoopa Street	55	55	62
Waiahi Street	268 (-124)	392	360
Palikea Street	411 (+57)	354	412
Helii Place	22 (-14)	36	31
Kuia Place	45	45	41
Kaulu Place	87	87	97
Akuli Road	40	40	Not on list provided to council
Pilikua Place	75	Not listed on bid[9]	64

[7] Adjustments are only necessary when the amount of material used is not as projected or more or less than 15 percent of the estimated amounts.

[8] Haoa Road was not repaved. However, roads division records show it had been repaved, so roads division was informed of the discrepancy so that the road would not be overlooked in future repaving projects.

[9]The bid document discloses that, in addition to the Pilikua Place resurfacing, the following projects were presented to the council as part of the fiscal year 2006-2007 island-wide resurfacing project, but were not among the projects

Waiahi Place	68	68	73

Alternate Additive[10]	Actual Tonnage	Contract Estimate	Estimate Provided to Council
Hanamā'ulu Road	631 (+23)	608	571

Source: Kaua'i County Auditor

The table shows that the estimates made for the presentation to the county council were significantly inaccurate, as were the estimates for the bid, because accurate road data was not available at the time the project was planned. The unavailability of project data will be discussed in the section entitled "Finding 1" of this report.

in the bid: Kanaele Road guardrails and additional work in the Kawaihau district (Puukaa Street, Hulali Loop, Ani Street, Kei Place, Meli Place, Lauloa Place, Laipo Road, and Kaokolo Place). The additional Kawaihau resurfacing work was proposed as an "alternate additive." "Alternate additive" is defined in the following footnote.

[10]"Alternate additive" is optional work that could be ordered by the county if funds are available. Alternate additives are priced separately in a bid. For the road resurfacing project for fiscal year 2006-07, Phase I, the Hanamā'ulu Road resurfacing was a Līhu'e district alternate additive. Although alternate additive work for the Kawaihau district was included in the division's proposal to the county council, the Hanamā'ulu Road resurfacing was the only alternate additive work ultimately included in the bid.

CHAPTER 2

AUDIT FINDINGS AND RECOMMENDATIONS

Finding 1. The planning and methodology for the test project were inadequate and did not conform to best practices.

Sub-finding 1.1 *The road selection process was not based on industry best practices, which require an analytical assessment of road conditions and public needs. Because the roads division did not have sufficient data to analytically prioritize roads based on need and condition, road selection was subjective and nontransparent.*

Based on interviews with past and present public works employees with knowledge of the test project, we determined that planning for the test project consisted of (1) estimating the amount of repaving that could be done with the funds allocated for repaving by the finance director and (2) selecting the roads to be repaved based on varied factors such as the last time the road was repaved (regardless of present condition), institutional memory about road conditions, citizen complaints and other considerations such as requests by elected officials. Reliance on such criteria, rather than actual data about road condition and usage, prevents the road maintenance program from being cost effective and producing better road conditions over the long run. Because the road repaving selection process is not based on a rating system with definable parameters, it also can become subjective.

The planning process was more complete in the past. The division used to maintain historical records of road repaving and road conditions, including photographs or complaints. These records were used to select roads for resurfacing, along with input from a pavement management system (MicroPaver). However, at the time the test project was planned in 2006, the roads chief did not know how to retrieve the records. The records were also requested during fieldwork for this audit, but current division personnel are unaware of the records, and are developing road data on their own.

The division did not have an overall road maintenance plan in 2006, but was working on one in-house and intended to complete it by the end of the 2007-08 fiscal year. At the time of fieldwork in 2010, the division still did not have a road maintenance plan or formal criteria for selecting roads.

A planning process such as used for the test project is non-transparent because road selection cannot be explained to county officials including the councilmembers and the public. Transparency in the road resurfacing program is important because the public is affected by road conditions. TRIP's research has shown that roads in need of repair cost each Hawaii motorist an average of $549 annually in extra vehicle operating costs – $485 million state-wide.[11] Extra vehicle operating costs include accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear. Because it does not prioritize maintenance resurfacing for the county roads based on condition, importance, traffic volume and other factors, as recommended by best practices, the roads division cannot justify its road selection to the travelling public and county policy makers.

The roads division should consider adopting asset management principles in its road maintenance plan, in order to effectively manage valuable road assets. Asset management has been defined as:

> *"... a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objectives."*[12]

The FHWA recommends using asset management principles to maintain roads and other transportation assets.[13] FHWA developed the following flowchart to illustrate steps and interrelations in the asset management analysis as applied to transportation assets.

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[11] The Road Information Program (TRIP), *"Providing Safe and Efficient Mobility in Hawai'i: The Cost to Drivers of Deficient Roads, Highway Congestion and Traffic Crashes,"* (March 2012) page 12.

[12] Definition from FHWA publication, "*Beyond the Short Term, Transportation Asset Management for Long-Term Sustainability, Accountability and Performance*," Publication No. FHWA-IF-10-009, page 8.

[13] The FHWA suggests that the asset management approach could be used for other assets such as bridges, vehicles, equipment, and even human resources.

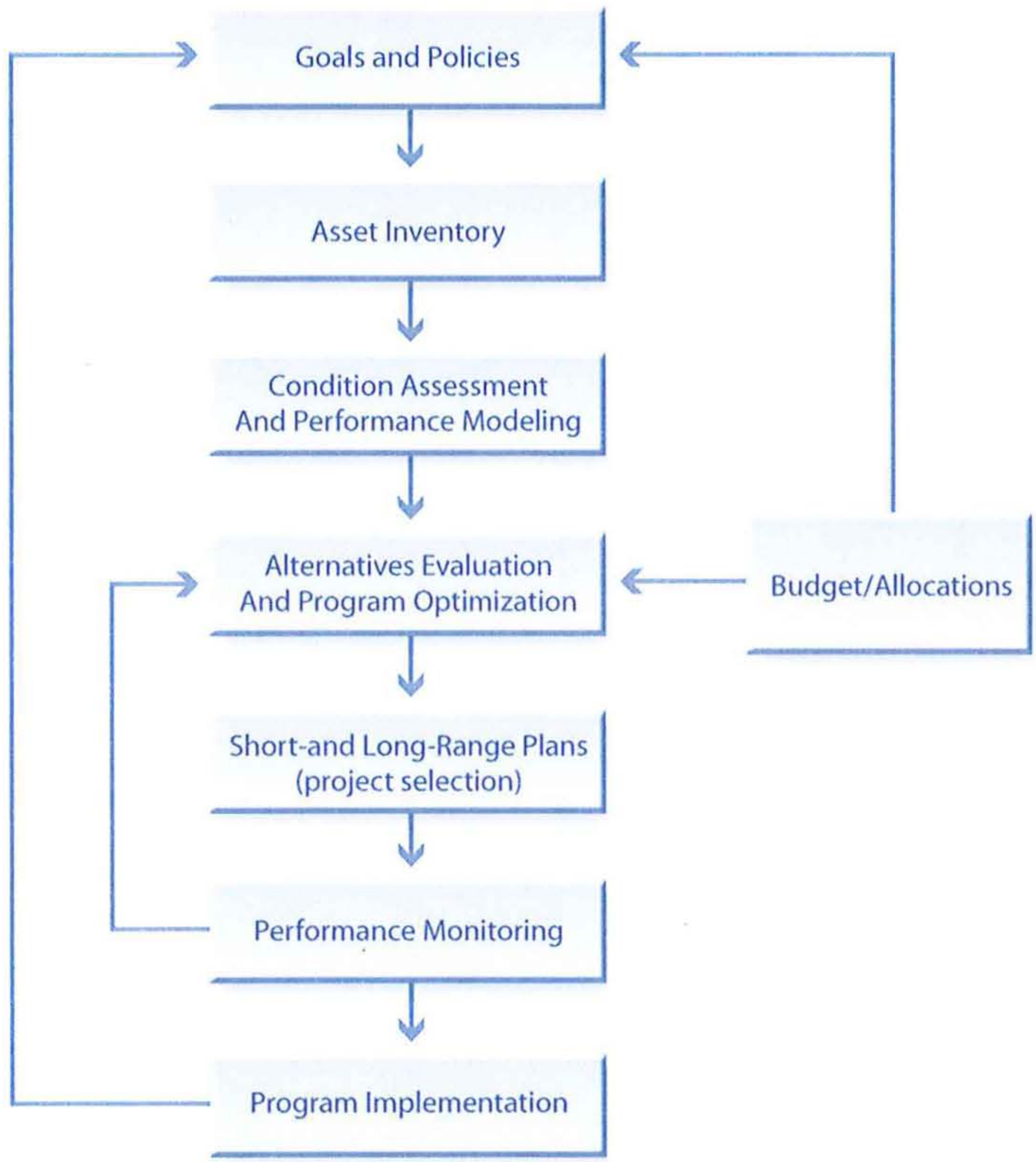


Figure from FHWA Publication No. FHWA-IF-10-009, "*Beyond the Short Term, Transportation Asset Management for Long-Term Sustainability, Accountability and Performance*," page 9.

The FHWA has also provided guidance on the way the asset management process can be applied to road maintenance (also known as pavement management). The FHWA guidance describes the following steps:

1. Create a target level of service or performance goal for roads (pavements) based on public requirements, such as the degree of smoothness the public desires balanced against the available budget.
2. Develop an inventory of roads that assesses current conditions.

3. Conduct an economic trade-off analysis to determine the estimated optimum amount to invest in roads to achieve the highest economic return.
4. Once the trade-off analysis is completed, conduct a rational analysis to allocate funds among preventive maintenance, reactive maintenance, rehabilitation, and road maintenance.
5. Once the optimum amount of road spending is estimated, each category's spending levels would be predicated upon a highest return on investment analysis, or, if such a formal analysis is not possible, engineering judgment and past experience.
6. Once road sections are selected for treatment, the actual treatment would be based upon a rational analysis of the individual road to provide it the lowest-cost treatment at the right time. The road's place on the pavement deterioration curve would be located and the appropriate preventive, reactive, rehabilitative or replacement treatment would be selected.
7. Once the road was brought to good condition, a planned and rational multi-year preventive maintenance schedule would be identified, and then executed.
8. The road's performance would be assessed annually and adjustments made in its treatment schedule to provide the highest remaining service life.
9. If the road fails to perform as expected, a root cause analysis would be conducted so the division can learn from the poor performance and can take corrective action so it is not repeated.
10. The attributes of that road's performance and treatment costs would be fed into a pavement management system to continually assess if goals were met and if adjustments need to be made to achieve overall goals, expenditures or strategies.

Adapted by the County Auditor from FHWA Publication No. FHWA-IF-10-009, "*Beyond the Short Term, Transportation Asset Management for Long-Term Sustainability, Accountability and Performance*," pages 8-9.

The division's plans to develop a pavement condition inventory and procure a pavement management system are important first steps in developing data to use in planning future repaving or other road maintenance programs, and can result in significant savings to the county. A study of the Phoenix Pavement management system savings demonstrated a 4 to 1 cost benefit ratio, under the most conservative of assumptions.[14] We commend the division for its initiative.

[14] See, Haas, Hudson and Tighe, "*Maximizing Customer Benefits As the Ultimate Goal of Pavement Management,*" Paper No. 42, Fifth International Conference on Managing Pavements (August 2001).

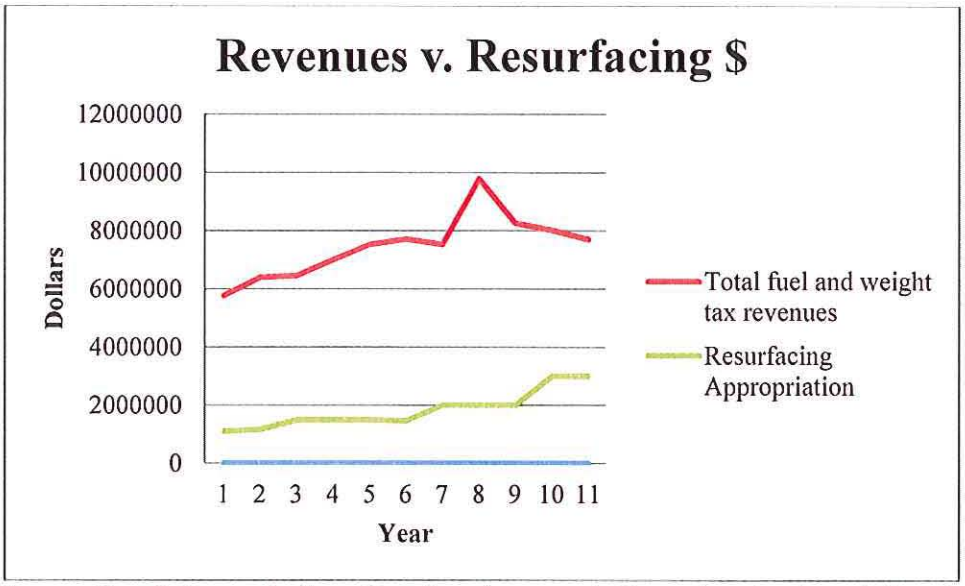
Recommendation (Sub-finding 1.1):

The administration and the county council should provide sufficient resources to enable the roads division to develop an asset management plan, to be used as a rational basis for (1) selecting roads for the annual road resurfacing program and (2) setting priorities for other highway projects.

Sub-finding 1.2 The funding provided for the road maintenance program was not based on needs and priorities. The roads division is provided a road resurfacing funding allocation determined by the director of finance.

The roads division's planning for the annual resurfacing program was based on the funding made available by the finance director. If asset management best practices for road maintenance planning and funding were used, the division would be provided the funds necessary to preserve asset (road) value and provide the road conditions desired by the public within the limits of the funds available for road maintenance (fuel and weight tax revenues).

However, the division is provided funding for road maintenance that is significantly less than the funding available for this purpose. The graph below shows the combined revenues from fuel and vehicle weight taxes for the past ten fiscal years (2000-2010), compared to the funding for annual road resurfacing projects.



Source: Kaua'i County Auditor. Data from the county's Comprehensive Annual Financial Reports, fiscal years 2001-11.

With the level of funding allowed, the division has averaged about only about 13 miles of resurfacing in the six annual programs that immediately preceded the test project.

Fiscal year	Miles of road repaved
2000-01	13.3
2001-02	12.2
2002-03	14
2003-04	12.5
2004-05	13.36
2005-06	11.41
Average miles repaved:	12.8

Since the county has 235 miles of paved roads, at this rate, any given road is repaved about every 20 years. As discussed later, studies have shown that in order to extend the life of the pavement, a road must be resurfaced by the time it reaches 75 percent of pavement life, typically 15 years. Beyond that, resurfacing may not be enough, and more costly rehabilitation could be required at approximately four times the cost of resurfacing. Thus, the county is essentially funding an ineffective road maintenance program, because at the rate roads are resurfaced, they are likely to require more rehabilitation than resurfacing can provide.

Recommendation (Sub-finding 1.2):

Public works and the roads division should conduct an economic trade-off analysis to determine the estimated optimum amount to invest in roads to achieve the highest economic return. The administration, director of finance and the county council should base the funding for road maintenance projects on this analysis.

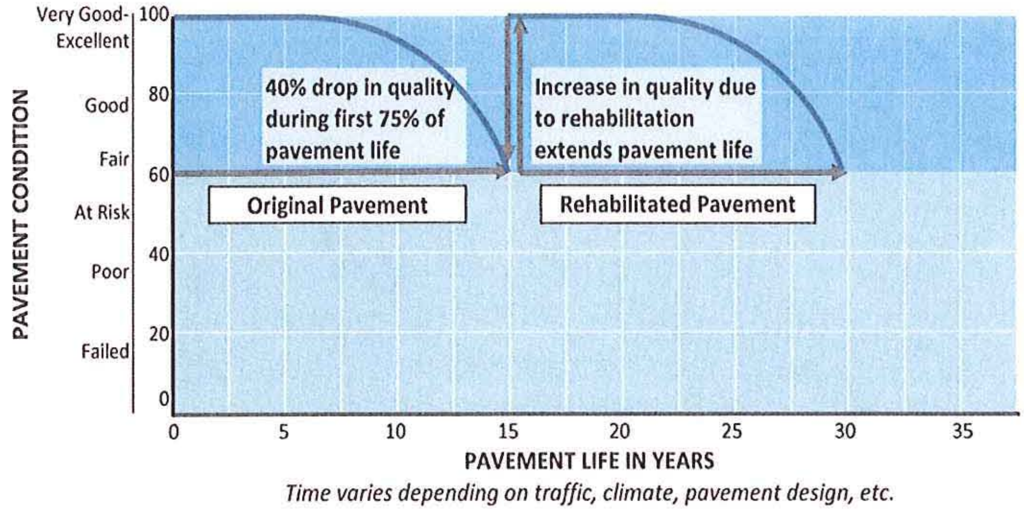
Sub-finding 1.3 The roads division did not have enough resources to plan, procure or begin the test project on time. Untimely execution increased road deterioration and may have increased project costs.

First, division manpower shortages required planning to be outsourced to another division (engineering) in the public works department. Next, work on the test project was projected to occur from September 22, 2006 to October 18, 2006. Because project procurement was delayed, work on the test project did not begin until September 17, 2008, almost two years after the planned start date.

Roadway Deterioration

Roads deteriorate further during delays, and require more expensive repairs. The functional life of roads is extended by timely maintenance and upgrades. As shown in the diagram below, repairs should be made before the pavement drops below "fair" condition, which is generally within the first 15 years of pavement life.

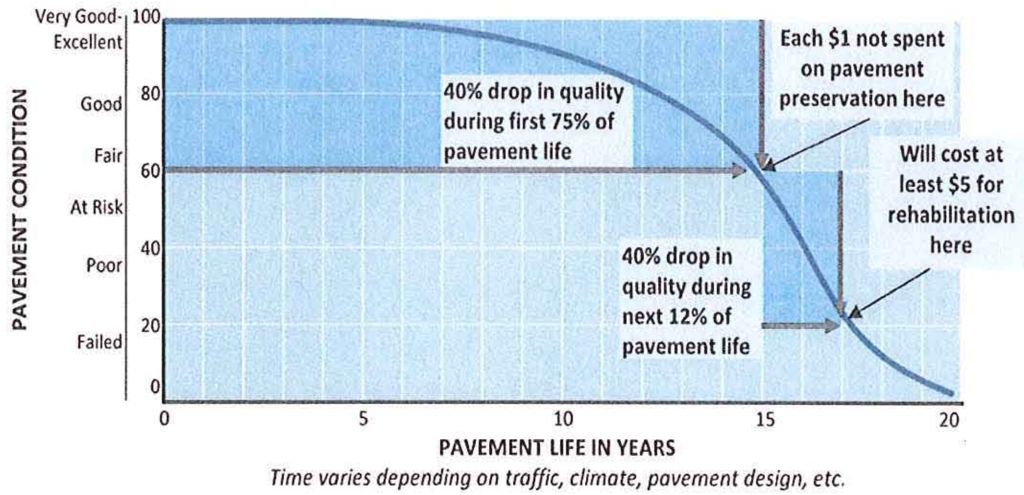
PAVEMENT LIFE EXTENDED BY TIMELY REPAIRS



Source: Berkeley City Auditor, *"Failing Streets: Time to Change Direction to Achieve Sustainability,"* (November 15, 2011), page 6.[15]

Untimely repairs also cost more, because the greater the deterioration, the greater the repair cost. The diagram below illustrates how rehabilitation costs increase if road maintenance is delayed and road conditions deteriorate.

UNTIMELY REPAIRS INCREASE MAINTENANCE COSTS



Source: Berkeley City Auditor, *"Failing Streets: Time to Change Direction to Achieve Sustainability,"* November 15, 2011, page 5.[16]

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[15] The audit report also cites the following sources for the chart: Metropolitan Transportation Commission, *"The Pothole Report: Can the Bay Area Have Better Roads?"* June 2011 and American Concrete Pavement Association, *"R&T Update: Concrete Pavement Research & Technology,"* Number 3.02 (February 2002).

[16] The audit report also cites the following sources for the chart: Metropolitan Transportation Commission, *"The Pothole Report: Can the Bay Area Have Better Roads?"* (June 2011) and American Concrete Pavement Association, *"R&T Update: Concrete Pavement Research & Technology,"* Number 3.02 (February 2002).

Other studies have shown that the cost ratios for roadwork related to treatment timing are $.70 if resurfaced with 40 percent of its useful life expended, $3.50 if 70 percent of its useful life is expended, $6.15 at 90 percent of its useful life expended and $14 once it is completely deteriorated.[17]

Material Cost Increases

The cost of asphalt increased during the delay. The price of asphaltic concrete fluctuates with the cost of oil. During the delay (from 2006 to 2008), the price of crude oil increased dramatically, from $64.21 a barrel in January 2006 to $97.91 per barrel in January 2008. Comparison of the per ton asphalt prices for the test project (Phase I of the 2006-07 road resurfacing contract) with the asphalt prices for the later (Phase II) phase of the same annual resurfacing program provide further confirmation that delays can increase costs. The Phase I prices were set when bids were opened in February 2008, while the Phase II prices were based on prices as of February 2009. The year between the procurement of Phases I and II may have resulted in a 30 percent price increase, due to volatility in the price of asphaltic concrete.

The division has cited insufficient resources and staff turnovers as the reasons for not beginning its annual road resurfacing programs on time. The division is making efforts to catch up on its backlog, such as hiring additional staff and requesting funds for a comprehensive road maintenance plan in the budget for the 2012-13 fiscal year.

Recommendation (Sub-finding 1.3):

We recommend that the county administration and county council continue to allocate sufficient resources necessary for the roads division to plan and execute timely annual road maintenance programs. The resources could include the funds needed to ensure an accurate pavement condition inventory, deploy an effective pavement management system and provide training for division employees. These measures will allow the division to use the pavement management system effectively and efficiently in planning road maintenance projects.

Sub-finding 1.4 The methodology for the test project was inadequate, since it was a formerly used resurfacing-only approach that did not consider road conditions or alternative methods or materials.

The test project methodology was a "one-size-fits-all" approach used in past road resurfacing programs. The half sized drawings show that the annual road maintenance program is limited to resurfacing. Since the resources allocated to

[17] American Association of State Highway and Transportation Officials, "*Executive Summary Report, Pavement Management Guide,*" (November 2001), page 2.

resurfacing by the county allow resurfacing to occur every 20 years, roadway wearing courses will probably reach the end of their life before they are resurfaced again.

Resurfacing only covers the first one and one-half inches of pavement, and is categorized as a preventive maintenance, which is usually limited to treating pavement deterioration considerably above acceptable limits.[18] However, if Kauaʻi County road conditions are typical of conditions elsewhere in the State, resurfacing alone is not sufficient to restore the roads to good condition.

According to a 2009 study by TRIP,[19] a nonprofit organization that researches, evaluates and distributes economic and technical data on highway transportation issues, roads rated in poor condition can be resurfaced, but often are too deteriorated and must be reconstructed. TRIP observes that most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition. The TRIP study notes that in 2007, 71 percent of major roads in Hawaiʻi were in poor or mediocre condition.[20] TRIP reports that in 2007, 27 percent of Hawaiʻi's roads were rated in poor condition, the country's fourth highest share of major roads in poor condition, behind only New Jersey, California and Rhode Island, and another 44 percent were rated as mediocre. Based on this Hawaiʻi-specific data, we can conclude that there will undoubtedly be areas designated for road resurfacing on Kauaʻi where road deterioration should instead be addressed by corrective maintenance, or deeper pavement reconstruction.

However, reconstruction of deteriorated pavement (corrective maintenance) was not included in the road repavement solicitations. No reconstruction of distressed areas was included in the drawings, and the resurfacing contracts do not include allowances for reconstruction. The division has included some reconstruction in its recent road maintenance solicitation, and it should continue to address reconstruction in its plans.

Neither the type of asphalt mix required for such, coarser grade (larger aggregates), and areas marked off for reconstruction were included in the drawings. Allowance quantities for this work priced as part of the bid were not included. This meant that field-directed reconstruction could not be conducted without a change order. For the test project, this work was completed under change order for significantly higher unit prices than the bid prices originally received. By making allowances for different types of resurfacing based on road

[18] Haas, Hudson and Tighe, "*Maximizing Customer Benefits as the Ultimate Goal of Pavement Management*," Paper No. 42, Fifth International Conference on Managing Pavements (August 2001).
[19] TRIP, *"Future Mobility in Hawaiʻi: Meeting the State's Need for Safe and Efficient Mobility,"* (September 2009), page 3.
[20] TRIP, *"Future Mobility in Hawaiʻi: Meeting the State's Need For Safe and Efficient Mobility,"* (September 2009), page 3.

conditions, the county may benefit itself as well as realize benefits to the public, including drivers.

The roads division needs to base its remedial road work on pavement conditions for another reason, that is, to select material based on a cost-benefit analysis. Asphaltic concrete is made from oil byproducts and aggregate, and the availability and price of these materials increased between 2008 and 2009 because of the price of petroleum. The decreasing availability of readily obtainable aggregate is also affecting all pavement programs. A Life Cycle Cost Analysis (LCCA) for the purpose of comparing material needs to be considered for areas that have to be frequently resurfaced. While the initial costs of Portland Cement Concrete (PCC) are significantly higher, its increased wear and durability results in significantly less maintenance. While it is generally recognized that for low volume subdivisions Asphaltic Concrete (AC) is the most economical choice, for high volume roads and intersections or areas where heavy vehicles operate (bus stops, truck routes), a LCCA should be conducted. Sometimes, a mix of the two pavement types is the most beneficial, with intersection areas in PCC and the roadways themselves in AC. As asphalt prices increase it will become even more necessary to consider LCCA for projects in more highly travelled areas. This analysis should also look at changing the overlays from AC to PCC in high wear areas or areas where insufficient pavement prism (thickness of original roadway) exists. Ultra-thin whitetopping, bonded overlay and unbonded overlay should also be considered as they can provide extended life in high use areas as well. The federal highway administration has been supporting such projects in Hawaii, in order to provide agencies with more options when selecting design options. All of these areas can be reviewed as part of a comprehensive pavement management program.

Recommendations (Sub-finding 1.4):

We recommend that the division consider allowing for reconstruction as part of the road maintenance solicitation even if exact locations cannot be specified. The contractor can be required to complete reconstruction at the prices in the bid, rather than as negotiated at a later date. Once the county's pavement management system is fully functioning, the areas requiring reconstruction can be better identified and included specifically in the plans for bidding purposes at the correct location with set unit pricing.

We recommend the division consider basing its remedial road work on pavement conditions and selecting the appropriate material for the conditions based on a cost-benefit analysis.

Sub-finding 1.5 The division uses inadequate standard operating policies and procedures for project-related tasks, and needs support to accelerate its development of revised policies and procedures.

Project management procedures were in a state of flux, and new procedures are currently being developed. A comprehensive procedures manual was not in place. A collection of memos from various county engineers was and still is the only official procedures manual. The memos were developed in 1995, are outdated, and do not conform to current contract requirements and the current procurement code. A new policy and standard operating procedure manual is currently being developed. It needs to be completed, checked for conformance to the state procurement code and checked against the contracts and general provisions utilized for projects on Kaua'i.

Additionally, historical project records are scant or unavailable. The policy and standard operating procedure manual should include documented procedures as to how communication records should be kept. A great deal of communication (day-to-day management) may be done by e-mail, so an electronic document control procedure should be developed and included.

The policy and manual also need to provide separate procedures or be developed with a companion manual for federal aid projects. The conformity is needed in order to comply with the procedures of the federal highway administration and the State department of transportation. Such compliance is a requirement for any road project using federal aid.

The procedures in place for continual monitoring were inadequate, and should include standardized procedures for:

- Comparing the actual construction costs to the project budget
- Reconciling deviations
- Project cost tracking, including the process used for early detection and mitigation of cost overruns
- Approval of pay estimates

Formalized project schedules adhering to a specific format did not appear to be in place. Weather and other allowable delays are recorded. Due to the relative simplicity of this work, detailed critical path management schedules are probably not warranted. Some consideration should be made to use a calendar day contract with adequate float. This will reduce the paperwork associated with the numerous rain day extensions.

Material logs verifying tonnage and as-built drawings were not on file or available. On the positive side, a balancing change order for actual quantities in place was created for final payment. Individual tonnage tickets were retained. Based on the data in the individual tonnage tickets, we calculated the difference between the tonnage in the original bid and the actual tonnage used for the test project. The calculations are summarized in the chart on pages 10 and 11 of this report. The differences in the estimates provided to the county council and the actual quantities required can be attributed to inadequate road data.

Recommendation (Sub-finding 1.5):

We recommend that the administration and the county council provide sufficient resources to enable the roads division to complete its policy and standard operating procedures manual.

Finding 2. The county's management of the highway fund is not consistent with state and county restrictions.

Sub-finding 2.1 The county's road resurfacing program is a repair and maintenance project, and should not be categorized as a capital project under the county charter.

The annual road resurfacing program, as described in the scope of work for the test project, consists of repairing and maintaining selected roads by laying a thin layer of asphalt over the road. As a repair and maintenance project, it should not be treated as a capital project under section 19.09(1) of the Kaua'i County Charter. This charter section specifically excludes repair and maintenance as capital projects.

> Section 19.09. Capital Program and Capital Budget.
>
> A. The capital program shall include:
>
> (1) Permanent public improvements, including planning, engineering and administrative costs, **but not the repair or maintenance thereof**.
> (2) The acquisition of land or any interest therein for any permanent public improvements.
> (3) The furnishings, fixtures and appurtenances of any permanent improvement when first constructed or acquired.
>
> Emphasis added.

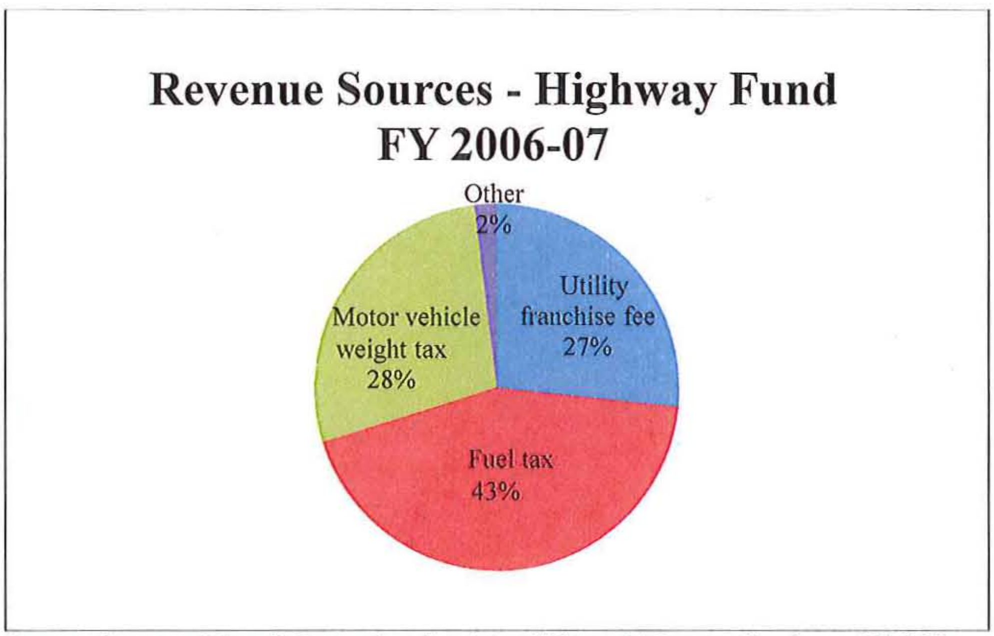
The public works department has categorized the annual road resurfacing projects as capital projects because it has not always been able to procure the road resurfacing work in time, and does not want unspent funds to lapse into the general fund at the end of the fiscal year. Thus, it has included the resurfacing program as a capital project because capital funds do not lapse. While the department's logic may be reasonable, the plain language of the county charter does not allow this practice.

Recommendation (Sub-finding 2.1):

We recommend that the administration and county council ensure that the island wide road resurfacing projects are categorized as required by the county charter, and that capital budget funds are used for permanent improvements and not repair and maintenance.

Sub-finding 2.2 The county's highway fund is comprised of monies subject to restrictions (such as fuel and vehicle weight taxes and public utility franchise fees). The funds are commingled and used for various purposes, including non-highway purposes, so the county cannot ensure that the funds are being used as required by law.

Major sources of revenue[21] for the highway fund are fuel and vehicle weight taxes and public utility franchise fees, which are statutorily restricted to highway-related purposes. Fuel and vehicle weight taxes comprised 71 percent of the highway fund in the 2006-07 fiscal year and public utility franchise fees were 27 percent of the total revenues.



Source: County of Kaua'i Comprehensive Annual Financial Report, fiscal year 2006-07.

However, highway fund expenditures are not separated by uses, so the county will have a difficult time proving that fuel and vehicle weight taxes and public utility franchise fees are used only for allowable purposes.

[21] Other sources of highway fund revenues include interest, and other intergovernmental revenues.

Use of fuel tax revenues is limited by statute to the following:

1. For payment of interest on and redemption of any bonds duly issued or sold on or after July 1, 1951, under chapter 47 for the financing or aiding in financing the construction of county highway tunnels, approach roads thereto, and highways. Such payments of interest and principal on the bonds when due, shall be first charges on such moneys so deposited in the fund.
2. For acquisition, designing, construction, reconstruction, improvement, repair, and maintenance of county main and general thoroughfares, highways, and other streets, street lights, storm drains, and bridges, including costs of new land therefor, when expenditures for the foregoing purposes cannot be financed under state-federal aid projects.
3. In the case of the city and county of Honolulu, for payment of the city and county's share in an improvement district initiated by the city and county for an improvement listed in (2) above which is permitted to be constructed in the city and county.
4. For the construction of county highway tunnels, overpasses, underpasses, and bridges, where such improvement cannot be made under state-federal aid projects.
5. For purposes and functions connected with county traffic control and preservation of safety upon the public highways and streets.
6. For purposes and functions in connection with mass transit.
7. For acquisition, design, construction, improvement, repair, and maintenance of bikeways.
8. No expenditure shall be made, out of revenues paid into any such fund, which will jeopardize federal aid for highway construction.

HRS section 243-6.

State statutes also limit the use of the vehicle weight taxes to the following purposes.

1. For acquisition, designing, construction, improvement, repair, and maintenance of public roads and highways, including without restriction of the foregoing purposes, costs of new land therefor, of permanent storm drains or new bridges, as well as repairs or additions to storm drains or bridges;
2. For installation, maintenance, and repair of street lights and power, and other charges for street lighting purposes, including replacement of old street lights, on county maintained public roads and highways;
3. For purposes and functions connected with traffic control and preservation of safety upon the public highways and streets;
4. For payment of interest on and redemption of bonds issued to finance highway and street construction and improvements;
5. In the case of the city and county of Honolulu, for appropriation for the police department up to the sum of $500,000. No expenditures shall be

made out of this fund which will jeopardize federal aid for highway construction;
6. For purposes and functions connected with mass transit; and
7. For the acquisition, design, construction, improvement, repair, and maintenance of bikeways.

HRS section 249-18.

State law further limits the use of public utility franchise fees to "...the construction, maintenance, improvement, and repair of public roads and highways of the county in which the same are received, including for the purposes of this section, the installation, maintenance, and repair of street lights and power, and other charges for street lighting purposes as well as the replacement of old street lights, and footpaths or sidewalks;..." (HRS section 46-47.)

The following chart shows the highway fund expenditures for the 2006-07 fiscal year.

Administration	2.15%	$	243,336
Hanapēpē Baseyard	9.97%		1,125,602
Kapa'a Baseyard	10.48%		1,183,309
Hanalei Baseyard	5.65%		637,508
Road signs and marking	3.26%		367,960
Auto maintenance and motor pool	19.60%		2,212,918
Maintenance - Street lights	7.68%		866,983
Equipment	13.66%		1,542,057
Capital Leases	0.14%		16,141
Employee benefits	14.90%		1,682,974
Central services costs	5.25%		592,931
Highway administrative overhead	7.26%		819,981
Total	100.00%	$	11,291,700

Source: County of Kaua'i Comprehensive Annual Financial Report, fiscal year 2006-07.

The CAFR discloses that the entire cost of the county baseyards is paid for by the highway fund, even if the baseyards are also used by the parks department and the solid waste division of public works. Similarly, the personnel and equipment costs of the roads division are entirely paid from the highway fund, despite that the equipment is used to assist other departments, and approximately 19 of the division's 99 positions are designated for refuse collection. The roads division lists the following as examples of non-highway work conducted in the 2010-11 fiscal year:

- Roads personnel working on weekends have assisted Solid Waste Division in the bin distribution for the conversion to the new automated refuse collection system.

- Roads and other DPW divisions assisted the County Anti-Drug Agency with coordinating and placement of 3 new Office Trailers class rooms (sic) at Kaua'i High School, King Kaumuali'i School and Kapa'a High School.
- Roads personnel have often diverted from their regular road maintenance projects to assist Parks Department and other agencies in their projects (2 major cleanups and maintenance of the Keālia Bike Path, assorted tree trimming and access easement maintenance).
- Roads assisted IT and KPD with battery replacement for island wide repeater sites.

Source: Annual Report 2010-2011, County of Kaua'i page XV-23.

The highway fund also pays for the entire cost of fuel dispensed through the Gas Boy system,[22] even if the fuel is used for various purposes unrelated to highways, such as for vehicles used by economic development, county attorney, county council, civil defense, prosecutor, parks, planning and finance.[23]

Although public works is required to pay administrative (central service) expenses from the highway fund, it has not been allowed by the director of finance to charge other departments and activities for their use of highway fund assets, including personnel and equipment, imposing a burden on the highway fund. This burden should be shared because the public works department and roads division are heavily reliant on the revenues from vehicle weight and fuel taxes--inherently unreliable sources of revenues. As the cost of gas rises, these revenues decrease, because drivers drive less and use lighter, more fuel-efficient vehicles. The graph on page 24 shows that revenues stopped increasing in fiscal year 2006-07. The division must plan its operations so they are sustainable when revenues decrease, and requiring the division to bear the cost of non-highway activities will interfere with sustainability plans and is not consistent with legal requirements.

The county does not have a chart of accounts dedicated strictly to funds allocated to highway uses. The lack of a dedicated chart of accounts, combined with a general absence of written administrative policies and procedures regarding the highway fund, have provided the administration with freedom in using the highway fund for non-highway activities. Additionally, the intent of the legal restrictions may not be served because if vehicle weight and fuel taxes are diverted to non-highway uses, taxpayers who pay these taxes and fees may not see the full extent of the road repairs and improvements that should result from their payments.

Recommendations (Sub-finding 2.2):

We recommend that the public works and finance departments amend their existing policies and procedures to include detailed policies on the administration

[22] The highway fund advances the cost of fuel, and is reimbursed by some, but not all users.

[23] Our audit of the county's fuel use found that these departments and agencies are not billed for the county gas they use. See, "*Audit of Fuel Costs, Consumption and Management (Interim Report)*" (April 2012), page 15.

and use of the highway fund to ensure compliance with state law restrictions on the use of fuel and vehicle weight taxes and public utility franchise fees.

We recommend the public works and finance departments develop a chart of accounts dedicated strictly to operations funded by the fuel and vehicle weight taxes and public utility franchise fees.

AUDITEE RESPONSE

The auditee concurs with all audit recommendations, and states that the Roads Division has implemented or begun to implement the recommendations within its jurisdiction. We commend the leadership of the Roads Division and the Department of Public Works for the proactive steps taken to improve the road maintenance program.

The auditee response is attached to this report as Appendix 1.

Appendix 1

Bernard P. Carvalho, Jr.
Mayor

Gary K. Heu
Managing Director

Larry Dill, P.E.
County Engineer

Lyle Tabata
Deputy County Engineer

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THE COUNTY AUDITOR
COUNTY OF KAUAI

August 3, 2012

Mr. Ernesto G. Pasion, County Auditor
Hale Pumehana Building
3083 Akahi Street, Room 203
Līhu'e, Hawai'i 96766-1102

Subject: Draft Audit Report
Road Maintenance Program, FY 2006-07, Phase I

Dear Mr. Pasion,

Thank you for the opportunity to submit a written response to the subject draft report. Following are our responses to the recommendations made therein.

Recommendation (Sub-finding 1.1): *The administration and the county council should provide sufficient resources to enable the roads division to develop an asset management plan, to be used as a rational basis for (1) selecting roads for the annual road resurfacing program and (2) setting priorities for other highway projects.*

We concur. Roads Division has obtained MicroPAVER, a pavement management system developed by the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory. MicroPAVER will be implemented to develop and organize the pavement inventory, assess the current condition of pavements, develop models to predict future conditions, report on past and future pavement performance, and develop scenarios for maintenance and repair based on budget or condition requirements, and plan projects.

Recommendation (Sub-finding 1.2): *Public works and the roads division should conduct an economic trade-off analysis to determine the estimated optimum amount to invest in roads to achieve the highest economic return. The administration, director of finance and the county council should base the funding for road maintenance projects on this analysis.*

We concur. The Island Wide Resurfacing plan for FY 12 includes plans for road reconstruction in addition to road resurfacing where the condition of the road is such that resurfacing only would provide a poor return on investment. Implementation of the MicroPAVER application will enhance our ability to select portions of roads for slurry sealing, resurfacing, or reconstruction in order to maximize return on investment and minimize life cycle costs.

Please be advised that the Director of Finance does not determine funding allocation of the roads resurfacing program.

Recommendation (Sub-finding 1.3): *We recommend that the county administration and county council continue to allocate resources necessary for the roads division to plan and execute timely annual road maintenance programs. The resources could include the funds needed to ensure an accurate pavement condition inventory, deploy an effective pavement management system and provide training for division employees. These measures will allow the division to use the pavement management system effectively and efficiently in planning road maintenance projects.*

We concur. Funding was provided which has allowed Roads Division to procure MicroPAVER, and funding for FY13 has been provided to procure a Maintenance Management Information System (MMIS) and to conduct an inspection and inventory of Kauai County Roads to provide accurate information for the two programs. The Roads Division has also hired additional staff to implement its pavement management program.

Recommendations (Sub-finding 1.4): *We recommend that the division consider allowing for reconstruction as part of the road maintenance solicitation even if exact locations cannot be specified. The contractor can be required to complete reconstruction at the prices in the bid, rather than as negotiated at a later date. Once the county's pavement management system is fully functioning, the areas requiring reconstruction can be better identified and included specifically in the plans for bidding purposes at the correct location with set unit pricing.*

We recommend the division consider basing its remedial road work on pavement conditions and select the appropriate material for the conditions based on a cost-benefit analysis.

We concur. The in-progress Island Wide Road Resurfacing FY 2011-2012 includes areas identified for reconstruction work in addition to resurfacing.

Recommendation (Sub-finding 1.5): *We recommend that the administration and the county council provide sufficient resources to enable the roads division to complete its policy and standard operating procedures manual.*

We concur. Roads Division is planning to develop policies and standard operating procedures, and implementation of MicroPAVER, the Maintenance Management Information System and the Inspection and Inventory of Kauai County Roads will help Roads to develop these policies and procedures. The Roads Division has also hired additional staff to implement its pavement management program.

Recommendation (Sub-finding 2.1): *We recommend that the administration and county council ensure that the island wide road resurfacing projects are categorized as required by the county charter, and that capital budget funds are used for permanent improvements and not repair and maintenance.*

We concur. The long standing decision to fund the road resurfacing program under the CIP Program was set forth by the county council and administrations of decades ago. The reason was to provide the Department of Public Works-Roads Division ample time and flexibility to obtain requisite county approvals, bids, and contract for the work. The County of Kaua'i, due to its size, has not been able to generate a lot of competition for this work. For many years, there was just one significant paving firm that would likely bid on this work, often requiring the contractor to coordinate the timing of their workload with the State of Hawai'i-Highways Division and other private sector work.

Recommendation (Sub-finding 2.2): *We recommend that the public works and finance departments amend their existing policies and procedures to include detailed policies on the administration and use of the highway fund to ensure compliance with state law restrictions on the use of fuel and vehicle weight taxes.*

We recommend the public works and finance departments develop a chart of accounts dedicated strictly to operations funded by the fuel and vehicle weight taxes.

We concur that the Department of Public Works and Department of Finance should amend its policies and procedures to ensure compliancy with state laws relative to fuel and vehicle weight taxes. The solution will likely include: 1) Amending budget practices by insuring that budgeted highway funds pay for eligible costs of the fund; 2) Department of Public Works create a work order system within the roads division to account for work provided to other departments and other funds; and 3) Ensuring through the budget process that eligible highway fund costs funded within the general fund and other funds are properly budgeted within the highway fund.

As always, we appreciate your efforts to help improve the operations of our Department.

Yours truly,

Larry Dill, P.E.
County Engineer

Concur:

Gary K. Heu
Managing Director

cc: Gary Heu, Managing Director
Wallace Rezentes, Director of Finance
Ed Renaud, Chief of Field Operations & Maintenance