

**Department of Public Works  
Village Streets Management Strategy**

**Performance Audit  
October 2009 through September 2017**

**OPA Report No. 17-09  
December 2017**



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**Performance Audit  
October 1, 2009 through September 30, 2017**

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December 2017**

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**EXECUTIVE SUMMARY**  
**Department of Public Works' Village Streets Management Strategy**  
**Report No. 17-09, December 2017**

For the first time, the Office of Public Accountability delivered the results of our audit and illustrated our findings in a video. You may view these videos at [www.opaguam.org](http://www.opaguam.org).

Our audit found that the Department of Public Works (DPW) Division of Highways did not have an effective asset management strategy to protect and prolong the life of village streets and ensure taxpayer dollars were utilized in the most cost effective manner for roads most in need of repair. Specifically,

1. The Division of Highways (the Division) did not take action to ensure the Village Streets Master Plan (VSMP) was regularly monitored and properly implemented;
2. Repairs of village streets were determined on a reactive basis; and
3. Management did not keep records of performance metrics to evaluate achievement of goals.

With the recent increase in liquid fuel taxes dedicating new funds for village street repairs, the need for effective asset management practices is especially important. Research has shown that without an effective asset management strategy, deterioration of village streets will accelerate to a point where the taxpayers will carry higher costs for street rehabilitation than if the streets had been maintained continuously.

**No Follow-through with the VSMP**

After the VSMP's development in 2009 to address rehabilitation of village streets, we found that the Division has not implemented, evaluated, and updated the VSMP after its publication. No village streets repair projects were done based on the results of the VSMP.

Moreover, the VSMP may be outdated to address the current conditions of village streets. Village streets' conditions are likely to change over time, therefore regular monitoring and assessment should be done throughout its life. The update the VSMP will allow the Division to identify the best treatment to sustain the performance and condition of roads.

**Unsystematic Pavement Management System for Village Streets**

The Division operated in an unsystematic and reactive manner to maintain and repair village streets. Despite the existence of the VSMP, the Division's awareness of village streets needing repair come through legislative mandates, phone calls from concerned individuals that were not documented or tracked, and irregular assessments of village streets conditions. Road repair decisions were made on a daily basis and rests on the Division Superintendent's discretion.

This unsystematic and subjective practice may lead to utilizing resources in an ineffective manner whereby village streets in better conditions may be prioritized over those in worse conditions.

Without systematic methods to assess conditions of village streets, there is a risk that selection may be based to favor certain constituents and neglect other factors important to prioritizing street repairs such as cost-effectiveness based on road conditions.

According to the Federal Highway Administration (FHWA), neglecting maintenance on deteriorating roads will also cost more over time. For every dollar spent on maintaining roads in good condition prevents the need to spend four to five times more to rehabilitate the same road that has not been maintained.

Unlike the locally funded village streets, the Division has developed a comprehensive Pavement Management System for its federally funded routed roads since 2011. This system assesses the conditions of roads; determines the need for preventive maintenance, corrective maintenance, rehabilitation, or removal and replacement; and shows the rate of pavement deterioration for the next few years. The Division's Acting Administrator stated that local funding is needed to adopt such a system for village streets.

### **Lack of Performance Measures to Evaluate Achievement of Goals**

The Division did not have performance measures to guide day-to-day operations and allow for strategic management. Such measures can also assist in evaluating whether the Division is achieving its goals. Due to the lack of an organized tracking system, the Division is unable to provide data on village streets repair activities. Accordingly, we were unable to quantify the number of repairs made on a particular village street, assess the nature of village streets repair work, or collect village street repair project cost information.

Subsequent to our review, the Division started compiling data electronically from their Daily Job Reports to assist management in obtaining statistics to measure their performance.

### **Conclusion and Recommendation**

While our audit focused on village streets, Guam's federally funded highways also require local funding for routine maintenance, yet only a Pavement Management System exists for federally funded routed roads. Public Law 34-44 was enacted to increase the liquid fuel tax rates for village street repairs and construction projects. Effective January 2018, diesel fuel will increase from \$0.10 to \$0.14 per gallon and other liquid fuel taxes will increase from \$0.11 to \$0.15 per gallon.

It is imperative that DPW be accountable and transparent with the use of taxpayer dollars just as well as federal funds and ensure it is protecting the major investments into our village streets and highways. This would require leadership focus in adopting transportation asset management best practices for village streets like it has done for Guam's highways. Given competing needs for operations and infrastructure maintenance, an asset management strategy can help DPW or public officials plan for needed funding to maintain roads and save costs over the life of the roads.

Doris Flores Brooks, CPA, CGFM  
Public Auditor



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# Introduction

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This report presents the results of our audit of the Department of Public Works (DPW) Division of Highways' asset management strategy for village streets from October 1, 2009 through September 30, 2017. This audit was conducted as part of the Office of Public Accountability's (OPA) annual audit plan for calendar year 2016. Our audit objective was to determine whether DPW has an effective asset management strategy to: (1) protect and prolong the life of village streets and (2) ensure taxpayer dollars were utilized in the most cost effective manner for roads in most need of repair.

For the first time in OPA's history, we also present the results of this audit and illustrate our findings through videos. You may view these videos in our website at [www.opaguam.org](http://www.opaguam.org).

Our audit objective, scope, and methodology are detailed in Appendix 1.

## Background

Public Law (P.L.) 1-88 enacted in 1952, established DPW with the responsibility of providing the following services in relation to roadway maintenance:

- Highway Maintenance - to ensure a safe, efficient, and modern highway system that is responsive to the needs of the people.
- Government-Wide Support - to enhance program effectiveness and efficiency by formulating policies, allocating resources, and administering budgetary and financial information related to operations and personnel and to provide maintenance services, repairs, construction services, and custodial work to upkeep public buildings and other government facilities.

## Division of Highways

The Division of Highways (the Division) is the arm of DPW that is responsible for overall management of the Guam Highway Fund and the island-wide Village Streets Restoration and Pothole Repairs Programs, including planning, design, and construction of all highway improvements projects and maintenance rehabilitation of the island's existing roadway network. The Division manages and administers the following duties:

Territorial highway maintenance, repair, and restoration of highway systems involving primary, secondary and collector roads, village streets, steel and concrete bridges, drainage systems, ponding basins, shoulder maintenance, highway encroachment permits, inspection and quality control reviews, maintenance contracts for drywells, insecticide treatment of guardrails and shoulders, in-house

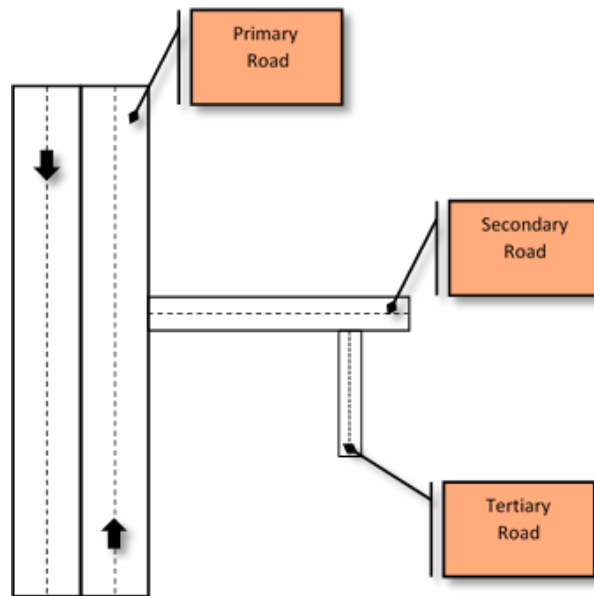
design of minor road construction, and participation in emergency response activities required by the Civil Defense Director.

Guam has 1,019 miles of public roads. Of the 1,019 miles, 160 miles are routed roads, 688 miles are village streets, and 171 miles are within the Department of Defense. Primary roads and village streets have different purposes:

1. Primary roads serve as the main highway on Guam. These roads are also known as routed roads and are usually associated with number identification, e.g., Route 1.
2. Village streets serve to connect residential areas to Guam's highway.
  - a. Secondary roads: roads that lead off from the primary roads, e.g., Ysengsong Road.
  - b. Tertiary roads: roads that lead off from secondary roads, e.g., street roads.

Diagram 1 below illustrates these road classifications.

**Diagram 1: Classification of Roads**



### **Village Streets Master Plan**

The 2030 Guam Transportation Plan (GTP) is a long-term strategy to improve transportation infrastructure and operations throughout Guam. GTP noted necessary improvements to village streets to be in line with DPW's vision of providing a safe, efficient, and sustainable transportation system for residents, visitors, and military personnel who supports economic diversification, resource conservation, and an exceptional quality of life.

The publication of the Village Streets Master Plan (VSMP) expanded on the needed village streets improvements noted in the GTP. In November 2009, DPW published the VSMP with funding by the Federal Highway Administration (FHWA). The VSMP established baselines for needed improvements on the village streets that connect to the federally funded routed road network.

The VSMP inventoried deficiencies in village streets such as potholes, unpaved roadways, and pavement failures among others. The processes to identify these deficiencies included

collaboration with the mayors, holding public meetings, and surveying approximately 400 locations. For example, the mayors assisted in identifying needed village street repairs, based on issues including: 1) safety, 2) pavement repair, 3) drainage, 4) street lights, 5) signage, 6) road extensions, and 7) road openings.

Overall, village streets deficiencies are categorized into 11 Work Types describing improvements: 1) traffic safety, 2) bus stops, 3) paving, 4) pavement repair, 5) street extension/widening, 6) lighting, 7) signage, 8) drainage, 9) utilities, 10) guardrails, and 11) structures and other. See Appendix 2 for a complete description of the 11 Work Types.

The VSMP prioritized village streets needing improvement based on evaluation criteria. Village streets with the highest total score are the highest priority projects and will be completed first when funding becomes available. See Appendix 3 for a complete description of the evaluation criteria. The VSMP estimated a cost of \$746 million (M) to complete work on the village streets.

Funding the prioritized village streets projects would come from Guam Liquid Fuel Tax revenue, federal government grants, and government-sponsored loans and bonds.

### **Guam Highway Fund**

The Guam Highway Fund (GHF)<sup>1</sup> funds the maintenance and construction of existing highways, including roads and village streets. Title 5 of the Guam Code Annotated (GCA) Chapter 54 defines the funding source for GHF. Specifically, monies received from Liquid Fuel Tax, annual vehicle license and registration fees, and revenue made available from the Federal Government for public highway purposes and highway safety-related plans, programs, and projects shall be deposited to GHF. Funding of GHF is separate from other funds of the Government of Guam (GovGuam) and independent records shall be kept.

No part or portion of the monies in the GHF or from whatever source derived shall be used for the maintenance or operation of a public transit system.

### **Mayors Village Streets Responsibilities**

Under 5 GCA Chapter 40, § 40113, mayors have exclusive responsibility for performing general minor repair and maintenance work not to exceed \$5,000 such as cleaning, painting, plumbing, trash collection, landscape maintenance, upkeep of drainage facilities, planting trees, plants and flowers, maintenance of street light signs, and replacement of streetlights.

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<sup>1</sup> Originally named as Territorial Highway Fund (THF).



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# Results of Audit

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We audited the Department of Public Works Division of Highways, the arm of DPW that is responsible for highway maintenance, repair, and restoration of village streets. We found that the Division did not have an effective management strategy to protect and prolong the life of village streets and ensure taxpayer dollars were utilized in the most cost effective manner for roads in most need of repair. Specifically,

1. The Division did not take action to ensure the VSMP was regularly monitored and properly implemented;
2. Repair of village streets were determined on a reactive basis; and
3. Management did not keep records of performance metrics to evaluate achievement of goals.

The Division plays a critical role in managing Guam's public roads and ensuring road assets will meet the needs of taxpayers. Research has shown that without an effective asset management strategy, deterioration of village streets can accelerate to a point where the taxpayers will carry a substantially higher cost for street rehabilitation than if the assets had been maintained throughout their lifetime.

## **Lack of Asset Management Approach for Village Streets Inhibits Accountability and Transparency**

According to FHWA, Transportation Asset Management (TAM) has long been recognized as a sound, long-term approach to managing infrastructure. It provides decision makers with a rational, long-term systematic process for making difficult and complex decisions about how to achieve the highest system condition levels at the lowest cost, over the longest term. By using TAM as an over-arching framework, management can demonstrate that they are making decisions to sustain the transportation system to the best of their ability over the long term. In addition, TAM provides a system of accountability to track and monitor decisions, costs, and asset condition. TAM relies upon strategic long-term goals, the pursuit of measureable targets, and the continuous evaluation of results.

In other words, asset management is a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their lifecycle. It helps transportation agencies manage scarce resources, articulate rational investment policies, measure the effects of past decisions and provide alternative scenarios to improve future performance. Refer to Appendix 4 for excerpts from FHWA's Report "Beyond the Short Term: Transportation Asset Management for Long-Term Sustainability, Accountability and Performance."

In contrast, we found that the Division did not have an effective management strategy to protect and prolong the life of village streets and ensure taxpayer dollars were utilized in the most cost effective manner for roads in most need of repair.

## No Follow-Through with VSMP

According to FHWA, the “Plan, Implement, Evaluate, Act” cycle is essential in asset management. Although DPW brought forth the first master plan detailing needed repairs for most village streets in November 2009, the other three elements of the cycle have not been engaged. We found that the Division has not implemented, evaluated, and updated the VSMP after its publication. Specifically, we found that: (1) no road repairs have materialized on any of the top prioritized roads in the VSMP; (2) in some cases, the Legislature mandated specific road repair projects that were not consistent with the priorities established by the VSMP; and (3) the VSMP is likely to be outdated as prioritized roads do not appear to reflect the most current mayors’ prioritized roads.

### *No Road Repairs on VSMP Top Prioritized Roads*

During our meeting with the Division, the Acting Administrator confirmed that no village street has been repaired based on the priorities established by the VSMP. Specifically, the Acting Administrator mentioned that the VSMP was just a plan with no funding. In addition, since the creation of the VSMP was federally funded, DPW does not have any plans to update the report because of local funding issues.

We reviewed the GHF financial audits for the past five years and noted the following common themes:

1. Expenditures were not consistent with the intent of GHF;
2. Non-highway or non-transportation projects were funded by the GHF; and
3. Guam Regional Transportation Authority expenditures were made against the fund, which are prohibited by the GHF enabling statute.

On average only 35%, or \$6.5M, of GHF expenditures were highway related and 65%, or \$12.3M, were non-highway related. See Table 1 for a summary of the apportionment of GHF expenditures.

**Table 1: GHF Expenditure Apportionment (in millions)**

<b>EXPENDITURES CLASSIFICATION</b>	<b>FY 2016</b>	<b>FY 2015</b>	<b>FY 2014</b>	<b>FY 2013</b>	<b>FY 2012</b>	<b>AVG%</b>	
TRANSPORTATION	\$6.4	\$6.2	\$8.0	\$6.6	\$5.1	\$6.5	35%
NON-TRANSPORTATION	\$15.2	\$15.5	\$10.3	\$10.1	\$10.5	\$12.3	65%
<b>TOTAL</b>	<b>\$21.6</b>	<b>\$21.7</b>	<b>\$18.3</b>	<b>\$16.7</b>	<b>\$15.6</b>	<b>\$18.8</b>	

Although non-transportation expenditures were in conflict with the intent of the GHF, we found that these expenditures were legislatively mandated from FY 2012 to FY 2016.

Of the transportation related costs, an average of 59% was spent on salaries for DPW employees.

While we understand the significant challenge of funding competing needs of the government, it appears that road maintenance projects were deferred to fund other operational needs. The development of the VSMP should have been utilized as a basis to help leaders plan for needed funding to prioritize road projects, maintain roads, and save costs over the life of the roads.

### *Road Repair Projects were Legislatively Influenced and Inconsistent with the VSMP*

According to FHWA,

*“Traditional planning and forecasting scenarios must be clearly understood by policy makers. The planning functions must fulfill an important forecasting role, both internally and externally to policy makers. Departments are always influenced by outside policy forces, whether they be gubernatorial, legislative, media-driven or embodied within a commission. These forces will seek to influence project selection and programming to whatever ends they deem most important. The policy and planning process of an organization can provide these influencers with clear information on the tradeoffs to be faced and the consequences to be expected from their decisions.”*

We found that the Legislature passed public laws to repair various roads, which was inconsistent with the priorities listed in the VSMP. See Appendix 5 for the public laws dealing with road repairs. When asked why certain roads received funding for repair and others did not, alarmingly, the Division did not know how the Legislature determines which roads get appropriations. We also found that part of the VSMP scoring mechanism allowed for higher points if the road project was legislatively mandated. However, based on asset management practices discussed by FHWA, as part of its planning function, the department should effectively influence investment decisions through clear, credible, and understandable forecasts, which include:

- the clear estimation of available resources;
- the trends in system condition;
- the investment tradeoff scenarios which are possible; and
- a recommendation for how to balance these complex and competing needs.

### ***VSMP Appears Outdated Based on Current Conditions of Roads***

Conditions of roads typically change overtime, but the results of the VSMP has remained the same for over five years. Based on our observations of the top 10 and bottom 10 prioritized roads of the VSMP<sup>2</sup>, it appeared that the lower ranked roads were in worse conditions compared to those with a higher ranking. See Appendices 6 and 7 for a listing of the Top 10 and Bottom 10 roads from the VSMP, respectively. See Appendices 8 through 10 for pictures of the VSMP roads surveyed.

In addition, we conducted an assessment of a listing of each mayor’s top three village streets that was submitted in relation to Bill No. 36-34. We observed that the mayors’ listing of roads appeared to reflect roads in poorer conditions than the Top 10 roads prioritized in the VSMP. Based on these observations, it appears the VSMP may be outdated to address the current conditions of village streets. Refer to Appendix 8 for a sample of pictures comparing the VSMP prioritized roads and the mayors’ prioritized roads. Also, for footage of the roads we surveyed, visit our website at [www.opaguam.org](http://www.opaguam.org).

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<sup>2</sup> Our methodology entailed surveying the top 10 and bottom 10 roads; however, due to the tied scores in the VSMP, there are 12 roads featured in the Top 10 listing and 14 roads featured in the Bottom 10 listing. In determining the Bottom 10 roads, we did not include roads with a negative score, which are a result of Rights of Way issues. See Appendices 6 and 7 for details.

**Image 1: Chalan Kareta (Dededo Mayor's Top Prioritized Street)**



**Image 2: Alageta St. (VSMP Top Prioritized Street for Dededo)**



We compared the mayors' prioritized roads against the VSMP priority ranking of those roads per village. We found that the village streets prioritization by the mayors differed from the VSMP where most of the mayors' selected streets fell either in the middle or in the bottom of the VSMP's priority list per village. Appendix 11 compares the mayor's 2016 top three road selections to the respective roads' ranking in the VSMP.

In addition, we noted that some of the selected village streets by the mayors have not yet been given a priority number and are labeled "TBD" (To Be Determined) in the VSMP. The village streets that have TBD in the VSMP, but were selected by the mayors for their top three choices include the following:

- Agana Heights: Frederico Drive
- Barrigada: Lizama Street Extension, Gajuman Street, and Pangelinan Way
- Hagåtña: 5<sup>th</sup> Street and Padre Palomo Street
- Mangilao: Matsumiya Street
- Santa Rita: Juan C. Lizama
- Tamuning-Tumon & Harmon: Tun Vicente Leon Guerrero Drive
- Yona: As Aguero Road

The condition of roads appeared to have changed compared to when the VSMP was conducted back in 2009. Using the original results of the VSMP to repair village streets may no longer be appropriate to address current village streets' conditions. It is inevitable that the conditions of village streets change over time, therefore regular monitoring and assessment should be done throughout the life of the transportation asset.

The Division has no plans to update the results of VSMP because of the cost associated of undertaking such a project. As stated previously, the VSMP was federally funded at a cost of up to \$700 thousand.

## **Unsystematic Pavement Management System for Village Streets**

According to FHWA, the asset management process includes a continuous and systematic setting of goals and evaluating results. The following illustrates the type of methodical, systematic and cyclical steps inherent with the asset management process:

1. Set a target level of service or performance goal for roads based on public requirements, such as the degree of smoothness desired by the public balanced against the available budget.
2. Develop an inventory of roads that assesses current conditions against desired targets.
3. Conduct an economic trade-off analysis to determine the estimated optimum amount to invest in roads to achieve the highest economic return.
4. Conduct a rational analysis to allocate funds among preventive maintenance, reactive maintenance, rehabilitation, and road replacement categories predicated upon a highest return on investment analysis, or, if such a formal analysis is not possible, engineering judgment and past experience can be relied upon.
5. Conduct a rational analysis for the road sections selected for treatment to provide 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.
6. Once the road is brought to good condition, a planned and rational multi-year preventive maintenance schedule would be identified, and then executed.
7. Annually assess road performance and make adjustments in its treatment schedule to provide the highest remaining service life.
8. If the road fails to perform as expected, a root cause analysis is conducted so the division can learn from the poor performance and can take corrective action so it is not repeated.
9. The attributes of that road's performance and treatment costs is 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.

The Division has developed a comprehensive long-term Pavement Management System for its federally funded highways that is generally in line with most of the steps outlined above. The Pavement Management System assigns a Pavement Condition Index (PCI) on scale from 0 (i.e., representing a failed pavement) to 100 (i.e., representing an excellent pavement with no observed distresses). Based on the PCI ranking, the need for preventive maintenance (PCI 86 to 100), corrective maintenance (PCI 56 to 85), rehabilitation (41 to 55), or removal and replacement (PCI less than 41) is determined. This system also forecasts the PCI values into the future, which shows the rate of pavement deterioration for the next few years. The Division's Acting Administrator stated that local funding is needed to adopt such a system for the village streets. See Appendix 12 for excerpts of the Pavement Management System report.

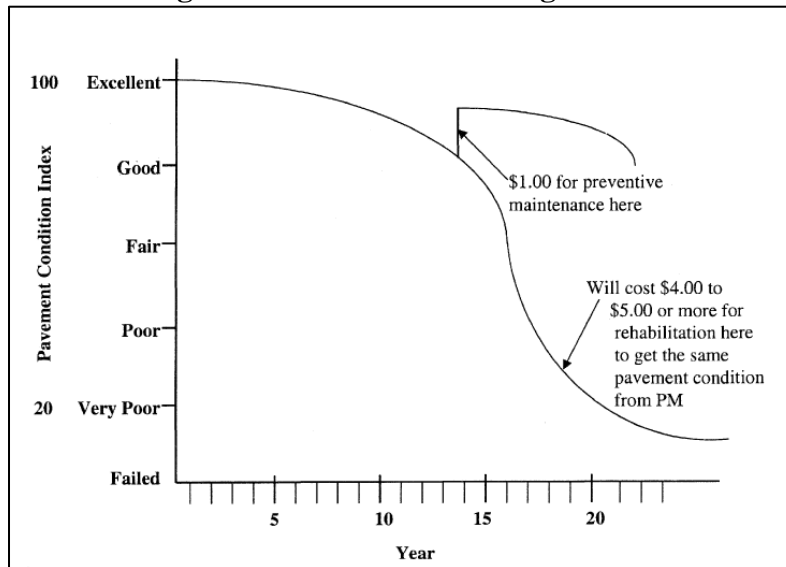
Unlike the strategic approach to maintaining federally funded highways, the Division operated in an unsystematic and reactive manner to maintain and repair village streets. Despite the existence of the VSMP, the Division's awareness of village streets needing repair come through legislative mandates, phone calls from concerned individuals that were not documented or tracked, and the Division's irregular assessment of village road conditions. Road repair decisions were made on a daily basis and rests on the Division Superintendent's discretion.

The Division has indicated that its day-to-day street repair decisions were based to some extent on public contacts, although these were not documented. The Division’s Administrative Assistant is the only person who takes in phone calls from concerned individuals. However, the Division has not established a mechanism to document these requests. Accordingly, we cannot quantify which village generates the most calls for street repairs, the nature of the complaints, and what were the conditions of village streets commonly brought to the attention of the Division. In addition, the Acting Administrator mentioned that a crew drives around to look at the roads every morning to identify pavement deterioration. We cannot verify the crew’s observations of the road conditions or their findings.

FHWA research has indicated that a reactive, short-term approach such as this impedes asset management. The subjectivity of the Division’s current practice for prioritizing road repairs may lead to utilizing resources in an ineffective manner. In addition, without adopting asset management best practices, there is a risk that road selection repairs may be executed to favor certain constituents and neglect factors important to prioritizing street repairs. For example, village streets in better conditions may be prioritized over those in worse conditions.

Furthermore, without a concrete long-term goal to manage transportation assets, village streets will eventually deteriorate and require reactive maintenance treatments to restore at least minimal functionality without regard to long-term need or performance. As figure 1 illustrates below, maintaining roads will cost more over time and prolonging poor road conditions will be more expensive to repair or rehabilitate without proper treatment. Every dollar spent on maintaining roads in in good condition prevents the need to spend four to five times more to rehabilitate the same road that has not been maintained.

**Figure 1: Cost of Maintaining Roads<sup>3</sup>**



In 2009, the VSMP estimated a cost of \$746M to rehabilitate village streets. In 2017, DPW stated that VSMP would cost approximately \$1 billion to rehabilitate village streets. We were not

<sup>3</sup> *Selecting a Preventative Maintenance Treatment for Flexible Pavements, Public No. FHWA-IF-00-027 (page 2).*

provided any documentation to substantiate this estimate; however, DPW agreed that due to delays in addressing the maintenance and repairs needed for our village streets, costs have increased over time.

## **Lack of Performance Measures to Evaluate Achievement of Goals**

As part of asset management, establishing performance measures assists in determining whether management is achieving its goals. Performance measures also assist management in identifying the root-causes of not achieving goals and thereby help to adjust activities to improve performance.

The Division does not have performance measures to guide day-to-day operations or measure whether management is achieving its goals. The Division cannot compile historical data to collect performance measures because 1) their filing system is antiquated and organized by date, rather than by location and 2) work performed on village streets cannot be cross-referenced because there has been no update to the inventory of village streets.

DPW crew use a Daily Job Report (DJR) to report work performed. The DJR details the scope of work, the location, the name of the crews who performed the work and their labor hours, the date the work was performed, and what material/tools were used. The DJRs are signed by the supervisor and turned in to the Administrative Assistant daily after every shift. The DJRs are then manually filed by date.

Because of the limitation in the Division's record keeping, we were unable to quantify the number of repairs on any particular village street, assess the nature of repair work, and collect repair project cost information.

Subsequent to our review, the Division started compiling data electronically from their DJR to assist management in obtaining statistics to measure their performance.

## **Increase in Funding Requires Good Stewardship through Asset Management Practices**

In February 2017, during a round table hearing concerning a proposed \$50M in Limited Obligation Highway Bonds, the DPW Director estimated \$2M per year is needed for an efficient maintenance of roads. The Director commented that DPW would roughly take three years to complete the top three village streets as prioritized in the VSMP. However, as mentioned previously, the VSMP should be re-evaluated. See Appendix 6 for a listing of the Top 10 prioritized VSMP roads.

Again, the Division's Acting Administrator stated that DPW does not have any plans to update the VSMP or adopt the Pavement Management System for village streets without additional local funding.

In October 2017, P.L. 34-44 was enacted to increase the liquid fuel tax rates for village street repairs and construction projects. Although this tax increase was originally proposed to gradually increase within the next three years, the entire increase will take effect in January 2018 as follows:

- Diesel fuel will increase from \$0.10 per gallon to \$0.14 per gallon,
- Other liquid fuel taxes from \$0.11 per gallon to \$0.15 per gallon, and
- Liquid fuel taxes for commercial aviation purposes from \$0.04 to \$0.08 per gallon.

The Department of Revenue and Taxation estimates to collect \$4M from the increase in liquid fuel taxes. DPW needs to demonstrate how it will make the best use of the resources and be good stewards of this increased funding. An appropriate means for demonstrating stewardship over the increased revenues would be for leadership to focus on adopting transportation asset management best practices. These best practices involve a strategic and systematic process of operating, maintaining, upgrading, and expanding roads effectively throughout their lifecycle and establishing performance metrics.



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# Conclusion and Recommendations

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According to a report released by the FHWA, transportation agencies are facing increasing pressures from policy makers to demonstrate results, accountability, and transparency in managing highway assets. In responding to these demands, the appeal of Transportation Asset Management becomes increasingly important.

The Division demonstrated good management by using a pavement management system for its federally funded highways. However, for our locally funded village streets, the Division did not have an effective asset management strategy to protect and extend the life of these assets and ensure taxpayer dollars were utilized in the most cost-effective manner. Specifically, we found the following:

- Despite the development of the 2009 VSMP, DPW did not take action to ensure the VSMP was regularly monitored and properly implemented.
- Repairs of village streets were determined on a daily basis and rests on the Division Superintendent's discretion. This practice of prioritizing road repairs is subjective and may lead to using resources inefficiently.
- Performance measures were not established to guide day-to-day operations or to measure whether management is achieving its goals.

Without proper management of our transportation asset, village streets have been left to deteriorate to a point where it will be more costly for the Government of Guam to repair.

Beginning January 2018, liquid fuel tax will increase as much as 40% for village street repairs. It is imperative that DPW be accountable and transparent with the use of taxpayer dollars just as well as with federal funds and ensure it is protecting the major investments into our village streets and highways. This would require leadership focus in adopting transportation asset management best practices for village streets, which involves a strategic and systematic process of operating, maintaining, upgrading and expanding roads effectively throughout their lifecycle and establishing performance metrics.

According to the Acting Administrator, the Division requires funding from \$3M to \$5M to implement a Pavement Management System and possibly update the VSMP. With the increase in liquid fuel tax revenue estimated to be nearly \$4M, we recommend that DPW:

1. Update the VSMP, or if deemed no longer appropriate, establish a system to objectively review and prioritize village streets so that funding is used on most critical needs;
2. Implement a Pavement Management System or a comparable system within their means to allow DPW to apply the lowest-cost treatment at the right time; and
3. Establish performance measures to guide village street operations and to evaluate achievement of goals.

To see the video of our audit as well as footage on the village streets we surveyed, visit our website at [www.opaguam.org](http://www.opaguam.org).

# Classification of Monetary Amounts

	Finding Description	Questioned Costs	Potential Savings	Unrealized Revenue	Other Financial Impact
1	<b>Lack of Asset Management Approach Inhibits Accountability and Transparency</b>	\$ -	\$ -	\$ -	\$ -
2	<b>No Follow-through with VSMP</b>				
	No Road Repairs on VSMP Top Prioritized Roads	\$ -	\$ -	\$ -	\$ -
	Road Repair Projects were Legislatively Influenced and Inconsistent with the VSMP	\$ -	\$ -	\$ -	\$ -
	VSMP Appears Outdated Based on Current Conditions of Roads	\$ -	\$ -	\$ -	\$ -
	<b>Subtotal</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
3	<b>Unsystematic Pavement Management System for Village Streets</b>	\$ -	\$ 254,000,000 <sup>4</sup>	\$ -	\$ -
4	<b>Lack of Performance Measures to Evaluate Achievement of Goals</b>	\$ -	\$ -	\$ -	\$ -
5	<b>Increase in Funding Requires Good Stewardship through Asset Management Practices</b>	\$ -	\$ -	\$ -	\$ -
	<b>Totals</b>	<b>\$ -</b>	<b>\$ 254,000,000</b>	<b>\$ -</b>	<b>\$ -</b>

<sup>4</sup> This amount represents the estimated increase of \$1 billion from the estimated \$746M cost identified in the 2009 VSMP to repair village streets due to delays in addressing maintenance and repairs needs.

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# Management Response and OPA Reply

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A draft was transmitted to DPW in December 2017 for their official response. We met with DPW officials in December 2017 to discuss our findings and recommendations where DPW expressed their general concurrence with the findings and recommendations.

On December 28, 2017, DPW provided their official response wherein management concurred with the finding that there is a lack of performance measures to evaluate the achievement of goals.

DPW disagreed with the following findings:

***1. The Division of Highways did not take action to ensure the VSMP was regularly monitored and properly implemented;***

OPA Reply: While DPW attributes their disagreement to being under resourced and making continual requests for funding to implement the VSMP, our finding remains as it has been nearly 10 years since the publication of the VSMP and no top prioritized village street has been worked on. Other projects have been undertaken outside the priorities of the VSMP. In addition, there has been no update to the VSMP to reflect current road conditions.

DPW agreed with our recommendation to establish a system to prioritize village streets in need of repair.

***2. Repairs of village streets are determined on a reactive basis.***

OPA Reply: DPW states that in FY 2018, DPW has prepared a list of potential streets to be repaired with the input of the mayors. Our scope covered the period from FY 2010 through FY 2017. During this period, we found no evidence of a long-term strategic approach to managing village streets. During our walkthrough, the Acting Administrator informed us that road repair decisions are made on a daily basis and rest on the Division of Highways Superintendent's discretion.

DPW did not agree without recommendation to establish a Pavement Management System, which is costly to implement. During our exit meeting, we agreed to revise the recommendation to implement a comparable system within their means to allow DPW to apply the lowest-cost treatment at the right time.

See Appendix 13 for DPW's management response.

The legislation creating the Office of Public Accountability requires agencies to prepare a corrective action plan to implement audit recommendations, to document the progress of implementing the recommendation, and to endeavor to complete implementation of the recommendations no later than the beginning of the next fiscal year. We will be contacting DPW

to provide the target date and title of the official(s) responsible for implementing the recommendations.

We appreciate the cooperation given to us by the staff and management of DPW Division of Highways and Mayors' Council of Guam during the course of this audit.

OFFICE OF PUBLIC ACCOUNTABILITY



Doris Flores Brooks, CPA, CGFM  
Public Auditor

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## Appendix 1

# Objective, Scope, & Methodology

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The audit objective was to determine whether DPW has an effective asset management strategy to (1) protect and prolong the life of village streets and (2) ensure taxpayer dollars were utilized in the most cost effective manner for roads in most need of repair.

The scope of our audit was from October 1, 2009 through September 30, 2017 (FY 2010 through FY 2017). The audit scope included the village streets as prioritized in the VSMP.

To answer our objective, we performed the following:

- Reviewed relevant laws, regulations, policies, and best practices.
- Reviewed prior audits and hotline tips.
- Interviewed pertinent officials and conducted walkthroughs of the Division of Highways village streets maintenance processes.
- Inquired if DPW has started any of the road projects per the VSMP.
- Inquired with the mayors the methodology for the selection of their top prioritized roads to be repaired.
- Conducted a “wind-shield” survey of the roads prioritized by each mayor and by the VSMP. This included taking pictures and video recordings.
- Compared each Mayors’ selected top three village streets for repair with their rankings in the VSMP.
- Reviewed the Pavement Management System Report developed for the maintenance of highways.
- Obtained the mileage and number of primary, secondary, and tertiary roads.

We compiled videos to present the results of our audit and illustrate our findings. You may visit our website at [www.opaguam.org](http://www.opaguam.org) to view these videos.

We conducted this audit in accordance with the standards for performance audits contained in Government Auditing Standards, issued by the Comptroller General of the United States of America. These standards require that we plan our audit objectives and perform the audit to obtain sufficient and 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.

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## Appendix 2

### VSMP Description of Work Types

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Work Type	Description
1. Traffic Safety	Locations needing signalized intersections, roadway realignment, striping, appropriate sight distance, speed bumps, or sidewalks.
2. Bus Stops	Locations needing bus shelter improvements or new bus shelters to better serve the surrounding homes.
3. Paving	Includes unpaved roads, roads that needed to be moved, or a road connecting two roads. This work type includes elements of work associated with paving a new road, such as signage and drainage, and all other work types were grouped into paving for an unpaved road.
4. Pavement Repair	All locations needing resurfacing, pothole repair or anti-skid surface treatment.
5. Street Extension/Widening	All locations needing widening or extending. Widening applies to all roads less than or equal to 16 feet wide. Approximate road widths were determined visually; no measurements were taken. When a street varied in width and was less than or equal to 16 feet in some locations, widening was selected as a work type.
6. Lighting	Locations needing light repair or installation. Where lights are spaced more than 100 feet apart, new light installation is necessary. Approximate lengths between lights were determined visually; no measurements were taken.
7. Signage	All locations where signs were damaged or missing. Regulatory, warning, and guide signs are all included within the signage work type.
8. Drainage	All locations where flooding occurs. Specific needs relating to drainage issues include culvert improvements, culvert maintenance, storm drain maintenance, and storm drain improvements.
9. Utilities	All locations where utility relocation or manhole adjustment/repair are determined to be needed. If at least two manholes were determined to be uneven with roadway pavement along one street, adjustments and/or repairs are necessary.
10. Guardrail	All locations where guardrail repair or installation is determined to be needed.
11. Structures and Other	All locations where bridges, large culverts, retaining walls, or fences required repair or installation.

## Appendix 3

### VSMP Evaluation Criteria

Criteria	Weight	Description
Public Health & Safety	5	Inadequate drainage, sight distance, pavement sections, etc. have made roadways less safe, and improvements are necessary, projects are rated high. Roadways with higher crash occurrences, if known, are rated higher than other roads. Bus shelters and replacement of missing regulatory signs are rated medium importance at least.
Law and Court Mandates	5	Roads listed in Budget Act of 2006 are assigned the highest value. Roads not listed in the Budget Act are assigned a value of zero. No other written agreements have been identified.
Population Served	4	Roads are classified based on visual assessment of aerial photographs.
Traffic Congestion	3	Roads at locations with significant traffic congestion reported are rated as highest importance. Information from site visits was used to assign intermediate ratings. Otherwise, no existing or future traffic congestion is expected.
Preservation of Existing Infrastructure	2	Roads with the worst pavement condition where significant capital investment has already been made (assessed on the basis of visible features) are rated the highest. Roads in fair and good condition score fewer points. Unnamed and/or unpaved roads are rated as "Not Applicable."
Cost	1	Lower cost projects are rated higher on the premise that more projects benefitting a wider cross-section of residents could be completed for limited funds.
Right of Way	-50	Roads identified as having Right of Way issues are assigned negative to ensure they fall to the bottom of priority ranking at this time, since right of way cannot be purchased. Intermediate ratings are not known at this time.

Note: Refer to Appendix 6 for the scoring system.

# Beyond The Short Term

Transportation Asset Management For Long-Term  
Sustainability, Accountability and Performance



U.S. Department of Transportation  
Federal Highway Administration





*Asset management provides the linkage between a need to demonstrate short-term performance while also ensuring long-term sustainability of highway assets.*

## **Executive Summary**

### **Asset Management: Linking Accountability and Sustainability**

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Transportation agencies face increasing pressures from Congress and state legislatures to demonstrate results, accountability and transparency in their management of highway assets. The National Surface Transportation Policy and Revenue Study Commission issued a clarion call for performance accountability in the federal transportation programs. Senior members of Congress are examining how to tie federal transportation spending to state accountability. The Government Accountability Office called for greater linkage between federal transportation expenditures and transportation agency results.

As transportation agencies consider how to respond to these calls for accountability and transparency, the appeal of Transportation Asset Management (TAM) becomes increasingly apparent. Asset Management provides agencies with a proven framework to demonstrate long-term accountability and accomplishment in the management of highway networks. As Asset Management matured in the past decade, it became increasing clear to its practitioners that it provides a systematic, data-driven and

continually improving framework for managing assets. In this maturation, Asset Management has come to closely resemble many other "quality systems" that major corporations use to meet customer goals, achieve performance targets and to continually improve their products. "Quality Systems" such as ISO, Six Sigma, the Balanced Scorecard, Baldrige, Total Quality Management and Performance Management all have elements which resemble Asset Management. All of these systems rely on variants of the famous "Plan, Do, Check, Act" processes first recommended by "quality" guru W. Edwards Deming in the 1950s and 1960s, and shown in Figure 1 on page 3. His writings lie at the heart of most major "quality" programs in use globally today. General Electric uses Six Sigma to ensure the quality of its jet engines. Award-winning hospitals rely on the Baldrige Process to ensure high levels of patient care. More than 17,000 ISO standards were developed to ensure quality in technical processes. A highway agency's embrace of Asset Management allows it to demonstrate that strategies similar to those which ensure the success of Fortune 500 companies ensure

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the long-term, sustainable quality of its highway network.

As these "quality" systems do for major corporations, Asset Management does for transportation agencies. It helps them manage scarce resources, articulate rational investment policies, measure the effects of past decisions and provide alternative scenarios to improve future performance. Asset Management allows highway agencies to document that their investment of scarce resources is made within a logical, comprehensive and systematic framework. Agencies that use Asset Management are so data driven, results focused and policy based, that, for them, producing performance metrics to demonstrate results is practically incidental. The agency officials reviewed in the following case studies expressed little trepidation about producing performance metrics because their Asset Management frameworks produce metrics as a matter of course.

This report addresses three major areas of Asset Management.

First, it examines asset management as a framework for demonstrating accountability - both in the short-term management of current transportation programs but also for the long-term sustainability of a state highway network. In describing Asset Management as a framework for demonstrating accountability, this report also spends considerable time addressing similarities and differences between Asset Management and Performance Management. To the uninitiated, the differences between the two management frameworks or philosophies may not be clear. The growing movement for accountability has led to a significant emphasis upon Performance Management and this report examines how it and Asset Management complement and enhance each other. The report also briefly compares and contrasts Asset Management to the other highly respected quality systems such as the Balanced Scorecard, ISO and Six Sigma.

Second, this report examines successful organizational structures and leadership strategies for instilling Asset Management into transportation agencies. Implementing Asset Management requires much more than buying a new software package or adopting new terminology. It involves creating new cross-cutting collaboration between traditionally separate

disciplines within a highway agency. When a highway agency is optimally structured or managed to fully capitalize on Asset Management, the formerly separate functions of planning, design, construction, maintenance and information technology all must work together more closely. Instead of operating strictly within their own silos, they need to collaborate to carefully manage assets throughout each phase of the asset's life. Successfully creating such cultural and organizational change requires skills in areas such as Change Management, Organizational Communication and Organizational Theory. These fields are seldom discussed in transportation literature but their practice can be essential to change the approach, the attitude and the culture of large organizations which are trying to embrace Asset Management. Shifting the direction of a large organization requires consistent, sustained leadership, communication, education and the creation of a common consensus among the different subcultures within a large organization.

Third, this report examines case studies of successful Asset Management programs across the United States and internationally. Although these transportation agencies differ significantly in their size, political structure, and resources, certain principles of how to instill Asset Management within them appear to be universal. Examples as diverse as North Carolina, Sweden, New Zealand, Utah, Maryland, Australia and Oregon are examined. Despite the significant geographic, cultural and governmental differences between these examples, their underlying strategies for successfully ingraining Asset Management into their organizations are strikingly similar.

Management trends come and go, creating a degree of skepticism among some that the lasting benefits of them may not be worth the effort to adopt them. However, the results of Asset Management are difficult to dispute, particularly during an era of accountability.

- In Utah, the agency has successfully convinced its Legislature and its Transportation Commission of its sound stewardship by demonstrating the systematic and comprehensive way it manages the state's highway assets. As a result, *Governing* magazine rates it an A for infrastructure

- management and its Legislature has bestowed unprecedented levels of funding upon the agency;
- In New Zealand, the national transportation agency has ingrained Asset Management into legislation. Now, it is a basic principle of national transportation policy that assets should be preserved at a high level, and be sustained into the future. More than 98 percent of the New Zealand pavements meet smoothness targets;
- In North Carolina, the Department of Transportation has successfully made organizational changes to improve and sustain the performance and condition of its assets to meet the needs of the 21<sup>st</sup> century. It has aligned and assigned ownership, roles, responsibility and accountability for performance of the system across business units, eliminating silos and forcing collaboration. Accountability for system performance is clear and transparent, starting at the highest level and cascading down to all employees. These approaches have been integrated into the agency's day-to-day operations and are expected to continue irrespective of changes to the leadership of the agency.
- In New South Wales, Australia, the state transportation agency has ingrained Asset Management into all levels of its operations. It produces a Total Asset Management Plan which functions like a parallel budget document to ensure that agency expenditures and agency efforts achieve its long-term Asset Management targets. It has sustained 87 percent of its pavements in good ride condition for at least a decade, and is forecast to maintain those levels into the future. It reports having only one load-limited bridge in its populous and urbanized state.
- In Sweden, the nation's Road Authority has used Asset Management and a Balanced Scorecard framework to keep more than 95% of major routes above acceptable pavement targets for more than a decade despite its harsh climate and diminishing purchasing power.
- The Oregon DOT has developed a comprehensive asset management process which guides decision making while also providing legislators with

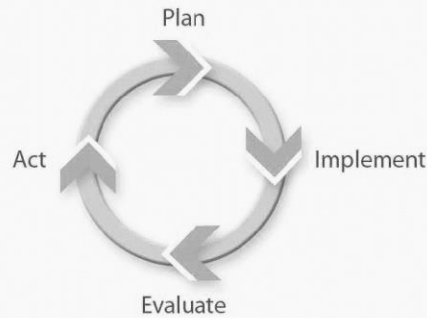


Figure 1 The "Plan, Implement, Evaluate, Act" cycle is inherent in "quality systems" and is essential in asset management as well.

performance information to assure them of the agency's direction.

These diverse agencies relied on several common management tactics for deploying Asset Management into their agencies.

### Leadership Driven

In all of the examples, the use of Asset Management has evolved from an isolated technical or planning effort to a department-wide focus which was embraced by senior leadership. The leadership impetus came in different forms. In some cases, it came from a strong individual executive who was personally committed to Asset Management. In other cases, strong legislative emphasis led to the embrace of Asset Management. While there are variations across agencies, it is clear that a strong leadership focus underlies sustained efforts to adopt Asset Management.

### Performance Focused

Another key finding is that departments that have successfully embraced Asset Management tend to have a strong systems approach to managing. That is, the department has embraced the Goal-Setting-and-Performance-Measurement processes inherent in the "quality systems" such as Six Sigma or ISO. In most of these cases, the focus upon systematically measuring and improving assets conditions was not unique. Similar strategies were applied to other

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department functions such as reducing crashes, delivering projects, or responding to customers. It appears that once Asset Management is ingrained in an agency, expanding a performance focus to other agency programs becomes simpler.

### **Transparent**

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A strong sense of transparency seems to accompany agencies that have embraced Asset Management. These agencies were able to document to the public and to policy makers that they have embraced a rational, systematic, long-term approach to managing assets, often for the lowest life-cycle costs.

### **Data-Driven**

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The journey to long-term Asset Management has led to a steady improvement in inventory data and forecasting tools. As the agencies become more focused upon asset performance, they become more data hungry and tend to improve their asset inventories and data systems.

### **Formally Structured**

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Formality marked many Asset Management systems. Asset Management was rooted in official policies, ingrained into agency standards, manifested in agency manuals and articulated in agency publications.

### **System Based**

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Although the management *structures* of these agencies

vary widely, they appear to have evolved similar management *strategies* including the primary strategy of adopting a systems approach to managing their agencies. In these states and countries, the Asset Management framework does what virtually all management systems are supposed to do – it provides a process, a logic, and a feedback cycle to methodically and comprehensively get things done with ever-improving results. By adopting Asset Management, these agencies find themselves well positioned to respond to the growing demands for performance and accountability.

This report does not replicate the excellent work in the Asset Management Guide, either the earlier 2002 guide or the current update. Nor does it seek to supplant any technical or procedural guidance on Pavement Management, Bridge Management or Maintenance Management. It relies very little on engineering but instead addresses organizational change management, institutional communication, organizational theory and systems approaches to managing. It examines the management strategies, the organizational structures and information needs of transportation executives who seek to lead their agencies to the next generation of Asset Management. The Asset Management Guide and its related reports explain the “what” of implementing Asset Management. This report examines “how” executives have instilled Asset Management and its related practices within their departments. It also explains how in an era of accountability, they can rely on Asset Management to demonstrate their agency’s efficiency, effectiveness and transparency.

Management Frameworks Defined
<p><b>Asset Management</b> is 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.</p>
<p><b>Pavement Management</b> provides decision makers at all management levels with optimum strategies derived through clearly established rational procedures. A Pavement Management System evaluates alternative strategies over a specified analysis period on a basis of predicated values of quantifiable attributes, subject to predetermined criteria and constraints.</p>
<p><b>Bridge Management</b> includes the establishment of optimal investment funding levels and performance goals for an inventory of bridges, as well as identification of the appropriate combinations of treatment scope and timing for each individual bridge over the lifecycle.</p>
<p><b>Performance Management</b> is an on-going process which translates strategic goals into relevant and detailed measures which are then tracked to ensure uniform achievement of institutional goals. Performance Management Systems include an "institutional learning" function in which the agency analyzes the root cause of failure or success to achieve its performance targets, and disseminates the lessons of that analysis to perpetuate continuous improvement.</p>

Table 1 The table provides definitions for the management systems commonly referenced in this report.

## Appendix 5

### Public Laws to Repair Various Roads

Public Law	Intent	Date Enacted	Notes
P.L. 33-110	Flood Mitigation and Other Capital Improvement Projects Related to Improving the Roads of Guam	February 3, 2016	<ul style="list-style-type: none"> <li>• Lot 6-1, Block 2, municipality of Barrigada (Route 8), as directed by the DPW Director up to \$550,000.</li> <li>• Various flood mitigation and road repair and pavement work in the village of Yigo, as directed by the Yigo Mayor up to \$300,000.</li> <li>• Lot 1019-5-4 and 1019-5-3, municipality of Barrigada, as directed by the Barrigada Mayor up to \$300,000.</li> <li>• Flood mitigation and road repair and pavement projects around the island, as directed by the DPW Director. Road repair and pavement projects shall be directed by the DPW Director and shall commence with improvements to Chalan Maimai Street in Chalan Pago, Swamp Road in Dededo, Lalo Street in Mangilao, and Chalan Frijoles Street in Dededo amounting to \$300,000.</li> <li>• Purchase of Lot 10-20, municipality of Agana Heights, to continue to be used as a government ponding basin in order to control flooding in the village \$120,000.</li> </ul>
P.L. 30-217	Paving of Village Streets as a Result of Traffic Diversions Related to Ongoing Road Construction Projects	December 13, 2010	<ul style="list-style-type: none"> <li>• \$1,050,000 appropriated to DPW for various road repairs. No funds shall be used for damage caused by road construction for the Department of Defense.</li> <li>• \$250,000 reserved for repair of street damages or associated traffic mitigation actions within Barrigada, including the Toto-Canada Road, caused by increased traffic resulting from the road construction project at the tri-intersection of Routes 8, 10, and 16.</li> <li>• \$800,000 reserved for completion of the Gil Baza access road within Yigo, as determined by the Department of Land Management and DPW. The construction of the Gil Baza access road shall not commence prior to the grant of public access for said road easement.</li> </ul>

## Appendix 6

# Top 10 Prioritized Village Streets per the VSMP

**Note:** Our methodology entailed surveying the top 10 roads. There are 12 roads presented due to the tied scores in the VSMP.

Road No.	Score*	Village	Location	Map Designation	Traffic Safety	Bus Stops	Paving	Pavement Repair	Street Extension/Widening	Lighting	Signage	Drainage	Utilities	Guardrail	Structures and Other	Cost (in millions)	Public Health & Safety	Law and Court Mandates	Population Served	Traffic Congestion	Preservation of existing infrastructure	Cost	Right of Way	
					1	2	3	4	5	6	7	8	9	10	11		5	5	4	3	2	1	-50	
1	56	Dededo	Alageta St	DE-20				x	x		x	x		x		\$0.641	3	3	3	3	2	1	0	
2	51	Hagåtña	Rt 7A Between 7th/8th, 9th/10th, Int 6th	HA-3		x		x	x		x	x				\$0.916	3	3	3	2	1	1	0	
3	50	Agana Heights	Tutujan Dr.	AH-1				x				x				\$0.299	3	3	2	2	2	2	0	
4	50	Sinajana	NW Spring Ln	SI-6	x			x	x		x	x				\$0.679	3	3	1	3	3	1	0	
5	50	Sinajana	Spring Ln	SI-3	x	x		x			x	x		x		\$0.649	3	3	2	3	1	1	0	
6	48	Agana Heights	Francisco Javier Ave	AH-7				x			x	x	x			\$1.409	3	3	2	2	2	0	0	
7	48	Agat	Pagachao Dr.	AG-58	x			x		x	x	x	x			\$1.567	3	3	2	2	2	0	0	
8	48	Piti	Assumption Dr.	PI-4				x		x	x	x			x	\$1.948	3	3	2	2	2	0	0	
9	48	Sinajana	Afame Rd	SI-1	x	x		x				x	x	x		\$1.890	3	3	2	2	2	0	0	
10	47	Chalan Pago	Nakie St	CPO-15	x						x	x		x		\$0.961	3	3	2	2	1	1	0	
11	47	Hagåtña	Chn Santo Papa	HA-4								x				\$0.222	3	3	1	3	1	2	0	
12	47	Mongmong	Aragon St	MO-56				x				x				\$0.365	3	3	3	0	2	1	0	
<b>Total</b>					<b>5</b>	<b>3</b>	<b>0</b>	<b>10</b>	<b>3</b>	<b>2</b>	<b>8</b>	<b>12</b>	<b>3</b>	<b>4</b>	<b>1</b>	<b>\$11.546</b>								

\*The higher the score, the higher the priority. To arrive at the score, multiply each rating by weight, e.g., Alageta St. 56 = [3\*5] + [3\*5] + [3\*4] + [3\*3] + [2\*2] + [1\*1] + [0\*-50]

## Appendix 7

### Bottom 10 Prioritized Village Streets per the VSMP

**Note:** Our methodology entailed surveying the bottom 10 roads. There are 14 roads presented due to the tied scores in the VSMP. In determining the bottom 10 roads, we did not include roads with a negative score, which are a result of Rights of Way issues.

Road No.	Score*	Village	Location	Map Designation	Traffic Safety	Bus Stops	Paving	Pavement Repair	Street	Lighting	Signage	Drainage	Utilities	Guardrail	Structures and Other	Cost (in millions)	Public Health & Safety	Law and Court Mandates	Population Served	Traffic Congestion	Preservation of existing infrastructure	Cost	Right of Way	
					1	2	3	4	5	6	7	8	9	10	11		5	5	4	3	2	1	-50	
1	10	Mangilao	Kin Cruz	MA-74			x									\$0.571	1	0	1	0	0	1	0	
2	10	Mangilao	Commissioner Way - Central/Mayor's Office	MA-145			x									\$0.571	1	0	1	0	0	1	0	
3	11	Yigo	Next to Chn Fadang	YI-187			x									\$0.646	2	0	0	0	0	1	0	
4	11	Yigo	Kyn Siongco	YI-178			x									\$0.646	2	0	0	0	0	1	0	
5	11	Yigo	Kyn Matilde White	YI-175			x									\$0.646	2	0	0	0	0	1	0	
6	11	Yigo	Chn Tupu	YI-21			x									\$0.944	2	0	0	0	0	1	0	
7	11	Talofofo	Ramon C Aguon Dr	TF-79			x									\$0.762	2	0	0	0	0	1	0	
8	11	Talofofo	Chn Tun Manet T Paulino	TF-99			x									\$0.561	2	0	0	0	0	1	0	
9	11	Mongmong	Palomo Ln	MO-5				x	x							\$0.104	1	0	0	0	2	2	0	
10	11	Mangilao	No Name off of Mamis St	MA-84			x									\$0.571	2	0	0	0	0	1	0	
11	11	Mangilao	Mayor Nito Blas Drive (Entrance to Mamis Street)	MA-210			x									\$0.571	2	0	0	0	0	1	0	
12	11	Mangilao	Leon Guerrero	MA-78			x									\$0.571	2	0	0	0	0	1	0	
13	11	Mangilao	Cup Of Gold	MA-148				x								\$0.054	1	0	0	0	2	2	0	
14	11	Mangilao	Bert Quichocho	MA-57			x									\$0.571	2	0	0	0	0	1	0	
<b>Total</b>					<b>0</b>	<b>0</b>	<b>12</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>\$7.789</b>								

\*The lower the score, the lower the priority.

To arrive at the score, multiply each rating by weight,

e.g., Kin Cruz 10 = [1\*5] + [0\*5] + [1\*4] + [0\*3] + [0\*2] + [1\*1] + [0\*-50]



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**Appendix 8**

**Sample of VSMP and Village Mayor's Prioritized Streets**



*Alageta St. - Dededo VSMP Priority: 56*  
Top Road: 1



*Chalan Kareta - Dededo Mayor Selected Road*



*Rt. 7A between 7<sup>th</sup>/8<sup>th</sup>, 9<sup>th</sup> & 10<sup>th</sup>, Int. 6<sup>th</sup> - Agana VSMP Priority: 51*  
Top Road: 2



*9<sup>th</sup> Street - Agana Mayor Selected Road*



*Tutujan Dr. - Agana Heights VSMP Priority: 50*  
Top Road: 3



*Frederico Dr. - Agana Heights Mayor Selected Road*

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**Appendix 8**

**Sample of VSMP and Village Mayor's Prioritized Streets**



*Spring Ln - Sinajana VSMP Priority: 50*  
Top Road: 5



*Tun Jose Joaquina Borja St. - Sinajana Mayor Selected Road*



*Pagachao Dr. - Agat VSMP Priority: 48*  
Top Road: 7



*Erskin Dr. - Agat Mayor Selected Road*



*Assumption Dr. - Piti VSMP Priority: 48*  
Top Road: 8



*J Street - Piti Mayor Selected Road*

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## Appendix 9

### Remaining Top 10 VSMP Village Streets Surveyed

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NW Spring Ln - Sinajana VSMP Priority: 50  
Top Road: 4



Francisco Javier Ave. - Agana Heights VSMP Priority: 48  
Top Road: 6



Afame Rd. - Sinajana VSMP Priority: 48  
Top Road: 9



Nakie St. - Chalan Pago VSMP Priority: 47  
Top Road: 10



Chn Santo Papa - Hagåtña VSMP Priority: 47  
Top Road: 11



Aragon St. - Mongmong VSMP Priority: 47  
Top Road: 12

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**Appendix 10**  
**VSMP Bottom 10 Streets Survey**

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*[Kin] Cruz, Mangilao - VSMP Priority: 10*  
Bottom Road: 1



*Commissioner Way, Mangilao - VSMP Priority: 10*  
Bottom Road: 2



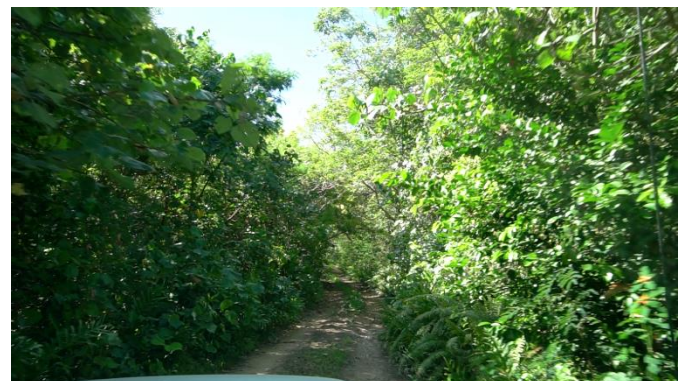
*[Next to] Chn Fadang, Yigo - VSMP Priority: 11*  
Bottom Road: 3



*Kyn Siongco, Yigo - VSMP Priority: 11*  
Bottom Road: 4



*Kyn Matilde White, Yigo - VSMP Priority: 11*  
Bottom Road: 5



*Chn Tupu, Yigo - VSMP Priority: 11*  
Bottom Road: 6

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**Appendix 10**  
**VSMP Bottom 10 Streets Surveyed**

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*Ramon C. Aguon Dr., Talofofo - VSMP Priority: 11*  
Bottom Road: 7



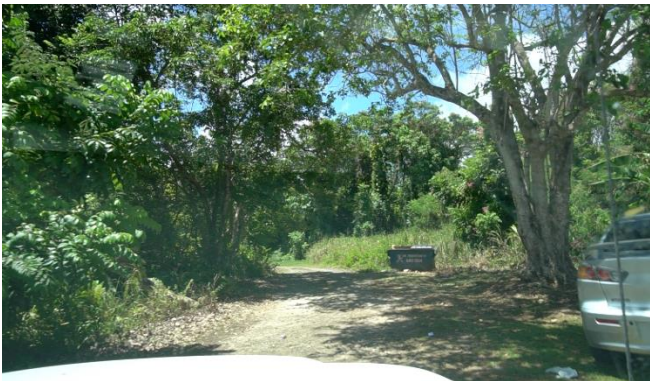
*[Chn. Tun] Manet T. Paulino, Talofofo - VSMP Priority 11*  
Note: streets leads to private residences, "No Trespassing" is posted.  
Bottom Road: 8



*Palamo Ln., Mongmong - VSMP Priority: 11*  
Bottom Road: 9



*[No Name Off of] Mamis St., Mangilao - VSMP Priority: 11*  
Bottom Road: 10



*Mayor Nito Blas Dr., Mangilao - VSMP Priority: 11*  
Bottom Road: 11



*[Leon] Guerro Dr., Mangilao - VSMP Priority: 11*  
Bottom Road: 12

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**Appendix 10**  
**VSMP Bottom 10 Streets Surveyed**

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*[Bert] Quichoho St., Mangilao - VSMP Priority: 11*  
Bottom Road: 13



*Cup of Gold, Mangilao - VSMP Priority: 11*  
Bottom Road: 14

TOP THREE MAYOR SELECTED ROADS FOR REPAIR <sup>5</sup>				VSMP RANKING OF THE SAME ROAD				
Village	Road	Cost (repaving only)	Rank <sup>6</sup>	Village	Road	Cost	Score	Rank
Agana Heights	Chalan Macajna	\$526,596	-	Agana Heights	Chn Macajna	\$2,416,000	42	3
Agana Heights	Joseph Cruz Ave	\$387,200	-	Agana Heights	Joseph Cruz Ave	\$2,319,000	36	8
Agana Heights	Federico Dr.	\$117,287	-	Agana Heights	Federico Dr.	TBD	TBD	TBD
Agat	Erskin Dr.	\$70,400	-	Agat	Erskin Dr.	\$1,469,000	44	3
Agat	Duenas St	\$129,100	-	Agat	Duenas St	\$666,000	37	14
Agat	San Vicente Ave	\$498,700	-	Agat	San Vicente Ave	\$1,693,000	42	4
Asan-Maina	Kalackac St	\$378,290	-	Asan-Maina	Kalackac Rd	\$1,642,000	29	7
Asan-Maina	Turner Road	\$1,065,456	-	Asan-Maina	Turner Rd	\$697,000	37	2
Asan-Maina	Sineso Field Rd	\$126,797	-	Asan-Maina	Sene'so Field Rd	\$288,000	30	5
Barrigada	Lizama St Extension	\$394,345	-	Barrigada	Lizama St	TBD	TBD	TBD
Barrigada	Gajuman St	\$126,620	-	Barrigada	Gajuman St	TBD	TBD	TBD
Barrigada	Pangelinan Way	\$100,256	-	Barrigada	Pangelinan Way	TBD	TBD	TBD
Dededo	Swamp Rd	\$838,950	-	Dededo	Swamp Rd	\$4,476,000	27	22
Dededo	Chalan Koda	\$633,600	-	Dededo	Chn Koda	\$6,098,000	38	2
Dededo	Chalan Karetá	\$166,356	-	Dededo	Chn Karetá	\$173,000	30	11
Hagåtña	9 <sup>th</sup> Street	\$92,689	-	Hagåtña	9 <sup>th</sup> St	\$450,000	39	5
Hagåtña	5 <sup>th</sup> Street	\$94,669	-	Hagåtña	5 <sup>th</sup> St	TBD	TBD	TBD
Hagåtña	Padre Palomo Street	\$98,402	-	Hagåtña	Padre Palomo Street	TBD	TBD	TBD
Inarajan	Chagamin Way	\$653,777	-	Inarajan	Chagame Wy	\$123,000	-135	55
Inarajan	Chalan Chanduha	N/A	-	Inarajan	Chn Chanduha	\$646,000	30	14
Inarajan	Francisco Meno Rd	N/A	-	Inarajan	Francisco D Meno Rd	\$281,000	16	32
Mangilao	Sergio Cruz St	\$403,195	-	Mangilao	Sergio Cruz Rd	\$1,370,000	18	144
Mangilao	Matsumiya St	\$280,381	-	Mangilao	Matsumiya St	TBD	TBD	TBD
Mangilao	Tuno Kiko Feja St	\$204,196	-	Mangilao	Tun Kiko Feja St	\$1,620,000	23	48
Merizo	Espinosa Ave	\$110,499	-	Merizo	Benny Espinosa Ave	\$3,401,000	44	1
Merizo	Pedro Tainatongo St	\$91,810	-	Merizo	Pedro SN Tainatongo St	\$323,000	30	10
Merizo	Demotrio Q. Meno St	\$73,234	-	Merizo	Dometro Meno St	\$2,416,000	16	18
Mongmong-Toto-Maite	J.A. Camacho St	\$308,139	-	Mongmong-Toto-Maite	J.A. Camacho St	\$1,637,000	29	17
Mongmong-Toto-Maite	Manibusan St	\$509,457	-	Mongmong-Toto-Maite	Manibusan St	\$554,000	39	9
Mongmong-Toto-Maite	South Peperu St	\$126,797	-	Mongmong-Toto-Maite	S Peperu St	\$813,000	43	3
Ordot	Chalan Famha	\$1,146,182	-	Ordot	Famha Rd/ Chn Famha	\$5,260,000	-119	96
Ordot	Chalan Chirik	\$76,138	-	Ordot	Chn Chirik	\$507,000	26	15
Ordot	Chalan Anonas	\$77,399	-	Ordot	Chn Anonas	\$333,000	14	84

<sup>5</sup> This list was subsequently updated as of February 13, 2017. Our “wind-shield” village streets survey was based on this original listing.

<sup>6</sup> No rankings were provided in the mayors' listing, the rank presented is based on the order the roads were presented in the listing.

**Appendix 11**  
**Ranking of Mayors' Selected Road in VSMP**

MAYOR SELECTED ROADS FOR REPAIR				VSMP RANKING OF THE SAME ROAD				
Village	Road	Cost (repaving only)	Rank	Village	Road	Cost	Score	Rank
Piti	J & K St	N/A	-	Piti	J & K St	\$820,000 (2)	15	27 & 28
Piti	Sabana/Santate Ln	N/A	-	Piti	Chn Sabana	\$439,000	37	9
Piti	Polaris Point <sup>7</sup>	\$267,204	-	Piti	Polaris Point	N/A <sup>8</sup>	N/A	N/A
Santa Rita	Namo Falls	\$87,490	-	Santa Rita	Namo Falls Rd	\$194,000	44	1
Santa Rita	Sgt. E Cruz, Upper	\$115,807	-	Santa Rita	Sgt. E Cruz	\$3,024,000	-108	185
Santa Rita	Juan C. Lizama	\$90,013	-	Santa Rita	Juan C. Lizama St	TBD	TBD	TBD
Sinajana	Tun Jose Joaquina Borja St	\$92,535	-	Sinajana	Tun Jaquina St	\$190,000	-134	27
Sinajana	N.E. Spring Ln	\$136,887	-	Sinajana	NE Spring Ln	\$370,000	15	25
Sinajana	Nungi St	\$90,013	-	Sinajana	Nungi St	\$396,000	35	6
Talofofo	Paulino Heights	\$404,608	-	Talofofo	Paulino Hts Rd	\$257,000	35	9
Talofofo	Perez Heights	\$303,291	-	Talofofo	Perez Heights	\$1,212,000	29	21
Talofofo	Siguenza St	\$77,810	-	Talofofo	Siguenza St	\$449,000	15	73
Tamuning-Tumon-Harmon	Tun Vicente Leon Guerrero Dr.	\$554,670	-	Tamuning-Tumon-Harmon	Tun Vicente Leon Guerrero Dr.	TBD	TBD	TBD
Tamuning-Tumon-Harmon	Carmen Memorial Dr.	\$166,356	-	Tamuning-Tumon-Harmon	Carmen Memorial Dr.	\$532,000	14	105
Tamuning-Tumon-Harmon	Cascahu	\$36,750	-	Tamuning-Tumon-Harmon	Cascahu St/ Cuscaho Rd	\$274,000	27	29
Umatac	Nino Perdido St	\$87,490	-	Umatac	Nino Perdido St	\$252,000	38	7
Umatac	Jose A. Quinata St	\$211,764	-	Umatac	Jose A. Quinata St (cemetery) West	\$794,000	39	2
Yigo	Fongu	\$138,455	-	Yigo	Chn Fungo	\$520,000	41	3
Yigo	Cabesa (Mataguac)	\$106,400	-	Yigo	Cabesa (Mataguac)	N/D <sup>9</sup>	N/D	N/D
Yigo	Gil Breeze	\$752,822	-	Yigo	Gil Breeze	N/A	N/A	N/A
Yona	Salas Rd	\$529,638	-	Yona	Salas Rd	\$3,375,000	14	23
Yona	As Baza Rd	\$225,591	-	Yona	As Baza Rd	\$1,378,000	25	14
Yona	As Aguero Rd	\$105,466	-	Yona	As Aguero Rd	TBD	TBD	TBD

<sup>7</sup> This road was not surveyed as the Mayor informed us during our windshield survey that this road has been replaced with Juan Isabel Street.

<sup>8</sup> N/A denotes Not Applicable as the village street is not listed in the VSMP.

<sup>9</sup> N/D denotes Not Determinable as there are more than one road in Yigo with either Cabesa or Mataguac, which made it difficult to determine which road the Mayor was referring to.



**GUAM  
PAVEMENT MANAGEMENT SYSTEM (PMS)  
ROUND II**

**Subcontract Agreement: MSTE2010-P01**

**FINAL REPORT**

**September 12, 2014**

**PREPARED FOR:**

**GUAM DEPARTMENT OF PUBLIC WORKS (DPW)  
542 NORTH MARINE CORP DRIVE  
TAMUNING, GUAM 96913**

**PREPARED BY:**



**17752 SKYPARK CIRCLE, SUITE 240  
IRVINE, CALIFORNIA 92614**

**PRIME CONTRACTOR:**

**PARSONS TRANSPORTATION GROUP  
590 SOUTH MARINE CORPS DRIVE, SUITE 403  
TAMUNING, GUAM 96913**



## EXECUTIVE SUMMARY

Sierra Transportation Engineers Inc. (STE) is pleased to provide this final report for the Guam Pavement Management System (PMS) Round II (Subcontract Agreement: MSTE2010-P01).

During 2011 and 2012, STE developed a comprehensive PMS for the Guam Department of Public Works (DPW) to enhance its maintenance and rehabilitation strategies following the MicroPAVER pavement management system. Before the start of distress data collection, a Site Specific Guam Distress Quality Plan was developed to establish consistent data collection and processing procedures for obtaining high quality distress data. In addition, STE developed a comprehensive set of ride quality protocols and quality control/quality assurance (QC/QA) checks for the Guam DPW and its representatives. The protocols and QC/QA documents are for using inertial profiler equipment adhering to the American Society of Testing and Materials (ASTM) standards and the Federal Highway Administration (FHWA) guidelines. The first round of pavement distress survey data collection, collection of IRI data, traffic volume classification (V/C) data and equivalent single axle load (ESAL) calculations were done in 2011. A final report called "Guam Pavement Management System (PMS) Development" submitted to Parsons Transportation Group dated January 31, 2012 contains very detailed description of all stated activities during the first round of PMS development and data collection.

This report contains detail information regarding the second round of PMS data collection for Guam network. The data collection occurred between February and July, 2014. STE's general scope of work was divided into three distinct areas, namely:

1. A second round of pavement distress data collection following the MicroPAVER PMS for 334 MicroPAVER sections consisted of two categories of roads namely; Guam Roads (GR) and Guam Haul Road Network (HRN) totaling approximately 220 miles.
2. Quality Control/Quality assurance (QC/QA) of second round of International Roughness Index (IRI) data collection and data input for all the 334 MicroPAVER distress sections.
3. Collecting and reporting traffic volume, vehicle classification, and Equivalent Single Axle Load (ESAL) data for 25 sites along several of the HRN and GR roadways.

STE has exported the Guam MicroPAVER database into a file, which is provided with this report. This file contains all the distress survey information, IRI information, ESAL values and can be readily opened by users in Guam with the MicroPAVER software.

MicroPAVER system uses the Pavement Condition Index (PCI) for rating a pavement condition. The PCI ranks pavement condition on a scale from 0 (i.e., representing a failed pavement) to 100 (i.e., representing an excellent pavement with no observed distresses). Based on the distress data gathered, the overall PCI for Guam Haul Road Network (HRN) is 83 and for Guam Roads (GR) network is 74. A review of all PCI data for all available sections of HRN and GR networks shows that:

- 43% of all sections are in the preventive maintenance category (i.e., PCI 86 to 100)
- 42% of all sections are in the corrective maintenance category (i.e., PCI 56 to 85)
- 9% of all sections are in the rehabilitation category (i.e., PCI 41 to 55)
- 6% of all sections are in the remove and replace category (i.e., PCI < 41)

GUAM PMS ROUND II  
SUBCONTRACT AGREEMENT: MSTE2010-PO1



STE forecasted the PCI values into the future using the MicroPAVER AC default model, which showed the rate of pavement deterioration for the next few years. By the year 2018, 26% of the PMS sections will be in the preventive maintenance category, 47% in the corrective maintenance category, 11% in the rehabilitation category, and 16% in the remove and replace category. This clearly shows the pavement deterioration trend over the next few years. Forecasted PCI values are critical for developing maintenance and rehabilitation strategies.

STE created IRI fields for each MicroPAVER section and placed all the IRI collected data into the MicroPAVER database. The IRI data and analysis presented in this report clearly indicate that Guam roadways are rough as compared to many other roadways in various states and jurisdictions around the U.S. The data indicates that none of the roadways tested were smooth (i.e., with an IRI less than 60 in/mile). Only 5% of the roadways had an acceptable IRI between 61 and 95 in/mile. Fifty six percent (56%) of the roadways are rough to very rough (i.e., IRI of 96 to 190 in/mile), and 39% of the roadways are extremely rough with IRI greater than 190 in/mile. This clearly shows the need for utilizing the smoothness specifications that was developed by STE and reported in 2012. A routine profiling program and implementation of Guam ride specification protocols for roadway rehabilitation/reconstruction projects would have a significant impact in enhancing ride quality on Guam roadways.

STE collected vehicle classification data using vehicle classification counters and road tubes for 25 sites along the Guam roadways between February and July of 2014. QC/QA procedures were followed to make sure that vehicles were properly placed into one of the thirteen FHWA vehicle classification bins. Tailgating algorithms were also used to distinguish between closely spaced vehicles. STE also calculated the ESAL values using the collected data. An electronic file containing the collected and analyzed traffic data is submitted with this report. STE has created fields for Weighted Average Daily Trips and Daily ESALS in the MicroPAVER database and has populated the fields with appropriate data.

As shown in this report, comparison of 2014 data with 2011 data shows that the overall network level PCI and IRI values have not change significantly over the last three years. The PCI and IRI data collections are independent of each other and performed by two independent contractors. A major reason for similar distress and IRI values for the overall network of HRN and GR can be contributed to maintenance, repairs, and reconstruction activities over the last three years.

The Guam MicroPAVER database is now active and contains two rounds of distress, smoothness, and traffic data. Forecasted values of PCI are needed to develop mid-term and long-term pavement management strategies. It is important to develop Guam specific PCI models because the island's environmental and traffic conditions are different than many other areas of the U.S. Given two sets of PCI data, STE used the MicroPAVER default model for forecasting future PCI values. STE strongly recommends a few more rounds of distress data collection to develop and calibrate a Guam specific MicroPAVER distress model. STE recommends one more round of distress, profiling and traffic data collection prior, in the midst, and after the military buildup construction activities. STE believes this data collection is crucial as many of the roadways are relatively old and are susceptible to sudden deterioration due to heavy construction loading during a military buildup. For analysis purposes, the best way to assess the impact of a military buildup on Guam roadways is to investigate the distress magnitudes and roughness before during and after construction activities. STE also recommends the use of portable Weigh-In-Motion (WIM) equipment to enhance the loading estimates of various construction trucks and vehicles during the military buildup. In order to set a strong baseline for the MicroPAVER system, STE recommends that the distress, profiling, and traffic data collection occurs at least once every two years. This schedule will provide adequate time for personnel training, adequate

**GUAM PMS ROUND II**  
SUBCONTRACT AGREEMENT: MSTE2010-PO1



data for populating a strong database, and plenty of data for modeling future PCI values and developing Guam specific pavement models. In addition, any other construction related data that is being gathered under various projects should be considered for incorporation into the MicroPAVER database.

Even with only two rounds of pavement data, the Guam MicroPAVER system is ready to be used as a part of a comprehensive pavement management program (PMP). The PCI data can be sorted to clearly and quickly show how the PCI values of Guam roadways are ranked for preventive maintenance, corrective maintenance, rehabilitation, or replacement strategies.

The PCI rankings can be utilized to prioritize and implement roadway improvements in Guam based on a given DPW short term (e.g., one year) and long term (e.g., five to seven year) budget. The use of MicroPAVER and a detailed PMP can significantly reduce the time it takes to develop an overall maintenance/repair strategy for Guam roadways. In addition, it would result in significant savings by implementing the proper pavement maintenance/repair strategy at the proper time. STE suggests the use of the MicroPAVER system, profiling, and ride specification protocols in all future planning for Guam roadway improvements. MicroPAVER is an active database. As such it requires routine data input (e.g., structure layer information) especially for all ongoing pavement construction activities.



The Honorable  
EDDIE BAZA CALVO  
Governor

The Honorable  
RAY S. TENORIO  
Lieutenant Governor



public works  
DIPARTAMENTON CHE'CHHO' PUPBLEKO  
GLENN LEON GUERRERO  
Director

ANDREW S. LEON GUERRERO  
Deputy Director

17-2227

DEC 28 2017

Doris Flores Brooks,  
Public Auditor  
Office of Public Accountability  
238 Archbishop Flores Street,  
Hagatna, Guam 96910

Subject: Draft Report – Department of Public Works Village Street Management Strategy

Hafa Adai Mrs. Brooks!

The Department of Public Works acknowledges the findings of the Office of Public Accountability in its draft report dated December 2017. We thank you and your staff for providing independent witness to the dilemma of the Division of Highways – how to manage our village streets network in a fiscal environment that provides less than sufficient resources to do the work that needs doing let alone develop an asset management program with which to better manage the maintenance of our roads.

The Division of Highways acknowledges the deficiencies pointed out in your report. However, we feel that such deficiencies need to be viewed within the proper context to fully understand the implications:

1. *The Division of Highways did not take action to ensure the Village Streets Master Plan (VSMP) was regularly monitored and properly implemented.*

We disagree. The following points are DPW's support for this disagreement.

A. **DPW has been under resourced.** The original VSMP was entirely funded in 2010 by federal dollars provided by the FHWA at a cost of approximately \$750,000. This amount was in part predicated by a couple of assumptions.

- 1) The buildup would create a spike in the population to include H2B workers and military personnel living in our villages, and,
- 2) That construction equipment would be travelling on some secondary and tertiary feeder roads. At that time, the total estimated cost of village street repair and rehabilitation projects was approaching over \$700 million.

The annual budget appropriation from the Guam Highway Fund (FY18) for the Division of Highways is approximately \$3.7 million. \$2.8 million of those funds go towards Salaries and Benefits. As part of our programmatic agreement with the FHWA, the DPW must use its local funds to maintain the routed road system. A severely restricted operational budget is not sufficient to properly maintain & repair our village streets or routed roads. The DPW also has numerous mandates including: storm drainage maintenance and construction; roadside lawn maintenance, river flood control and injection well maintenance; highway encroachment inspections; junk vehicle removal; traffic management; ponding basin maintenance; and, wake and fiesta mayoral services support to name just a few.

- B. **DPW's continual request for funding to repair our village streets is the first step in implementing the VSMP.** Every DPW Director in recent history for at least the last 10 years has requested increased funding in order to perform more maintenance on the village streets. When the VSMP was first developed, numerous presentations were made to the community, the administration, and the legislature. Additionally, for the last 3 budget hearings, the DPW has requested for at least \$2M to start the village street repairs.

There are, however, fruits from our current administration. In FY17, the Governor of Guam requested an additional \$2 million for village street repairs. However, that line item was ultimately struck from the final appropriation by the legislature. The 34<sup>th</sup> Guam Legislature in its FY18 Budget Act did appropriate an additional \$1.8 million to the DPW for village streets road resurfacing and repairs.

- C. **The passage of PL 34-44 "AN ACT TO AMEND § 26403 OF ARTICLE 4, CHAPTER 26, DIVISION 2, TITLE 11, GUAM CODE ANNOTATED, RELATIVE TO INCREASING THE LIQUID FUELS TAX RATES BY FOUR CENTS (\$0.04) PER GALLON, EFFECTIVE JANUARY 1, 2018, FOR THE PURPOSE OF FUNDING VILLAGE ROAD REPAIR AND CONSTRUCTION PROJECTS."** The expected increase in taxes is estimated to yield an additional \$3.5M in funds for repairing our village streets. Next steps will be to a) implement an asset management system which updates and prioritizes streets in need of repair and b) regularly report on the DPW's implementation progress. A copy of first report submitted in December 15, 2017 to the Governor is attached for your files.

2. *Repairs of village streets are determined on a reactive basis.*

We disagree. The following 3 points support our disagreement.

- A. Since the development of the VSMP, the following village streets were repaired: Chalan Lamasu, Chanlan Guaguac, Gil Baza, Chalan Balaku. The repair of the Chalan Lamasu village street, was mandated by PL 32-053, thus the DPW should not be held accountable for the determination of this street's repair. Once Chalan Lamasu was repaired, Chalan Balaku and Chalan Guagua was repaired in coordination of Chalan Lamasu.
- B. With the \$1.8 million appropriation made in FY18 as well as additional \$2M allocated from the Governors office, the DPW has prepared a list of potential streets to be repaired. Together with the input of the Mayors, as well as the information in the VSMP, this list was compiled to address at least one street per village. Our highway maintenance crews will do the base work and the DPW will contract out for the final layer of pavement. Please see the attached letter to the Governor outlining the list of streets affected. As you can see, we have taken a more proactive approach with the additional funding that was given to the DPW. This process together with the development of the village streets asset management system is our methodological approach to the repairing our village streets.
- C. Responses to frequent calls should not be viewed as reactions to repairing village streets. Rather, it should be viewed as emergency road repairs for pothole issues, flooding, minor failures, etc.

Although necessary and immediate, the repair of village streets /reconstruction of a roadway is a time-consuming process. Once funds have finally been identified and the roadways selected, a design must first be completed. Once that portion is accomplished, the procurement, permitting and contractual process begins. It takes up to 2 to 4 years from the initial concept to final completion. The planning to address a repair of a street in the VSMP is a long and lengthy process.

What the OPA may consider reactive are the previously mentioned daily calls the DPW receives regarding various issues and complaints. The DPW assesses the requests and the HMC Superintendent prioritizes said requests. It is based on safety and it is not just done arbitrarily or reactionary. It is not for the repair of a village street as such repair takes years to plan and execute.

3. *Management does not keep records of performance metrics to evaluate achievement of goals.*

We concur.

The Division of Highways has begun implementing systems to keep better records of the work it does with respect to village street work (pothole repair, storm drain cleaning, etc) and will aggregate those records into a regular report going forward. We acknowledge that our processes have room for improvement and are working towards better tracking and documentation overall within the Department and all its divisions. We thank the OPA for their suggestions and we have begun the process of tracking our various requests.

4. *Other Issues indicated in the audit report.*

The OPA Report, in addition to citing its findings, suggests corrective actions which warrant some clarification. The report suggests that a Pavement Management System (PMS) which was implemented for the routed road network on Guam be developed or transposed for use on the village streets network. It should be made clear that the current PMS consists of several very expensive inspection and data collection procedures that have been studied extensively by specialized engineers using empirical methods to understand the effects of heavy trucks on the U.S. Highway Network in the course of interstate commerce activities. This type of system would not translate meaningfully to the village street network where the primary use is for residential traffic at less than highway speeds. Even if it were able to be applied, the estimated cost per round of data collection and analysis is estimated to be between \$3.5 million and \$5 million wherein a minimum of 3 rounds is recommended to obtain a reliable baseline for developing a good maintenance program. And while implementing a PMS for the village streets might first appear to be a desirable option, in our reality of limited funding, the DPW would prefer to use its scarce funding to actually repair roads rather than spend the first \$10 million to \$15 million studying how bad they are. Rather, we have adapted FHWA standards for roadway construction applying them as we repair, reconstruct or repave our village streets.

It should also be made clear that the FHWA only mandates the use of the PMS for the U.S. Highway Network and does not mandate its use elsewhere by the states. Since Guam is not part of the U.S. Highway Network, we are exempted from this mandate. The FHWA implemented the PMS for Guam due to the anticipated excessive wear that would be accompanied by military build-up activities. If not for this fact, the PMS may not have been funded or implemented by the FHWA at all.


While we very much appreciate the findings and suggestions cited by the Office of the Public Auditor and

542 North Marine Corps Drive, Tamuning, Guam 96913 • Tel (671) 646-3131 / 3232 • Fax (671) 649-6178

its attestation to our dire need for additional funding, the reality is that we will always be playing catch-up with respect to the construction and maintenance of the village street network for many years to come.

In conclusion, despite the limited funding, coupled with ever increasing unfunded local and federal mandates, we are proud of the work that the Division of Highways accomplishes everyday with very limited resources. We ask that the Office of the Public Auditor recognize this and help advocate for support from our lawmakers so that we can ensure the quality of life and safety of our motoring public.

Respectfully,



Glenn Leon Guerrero,  
Director





The Honorable  
EDDIE BAZA CALVO  
Governor

The Honorable  
RAY TENORIO  
Lieutenant Governor



GLENN LEON GUERRERO  
Director

ANDREW LEON GUERRERO,  
Deputy Director

December 14, 2017

The Honorable Edward Baza Calvo  
Governor of Guam  
Office of the Governor of Guam  
513W Marine Corps Drive  
Ricardo J. Bordallo Complex  
Hagåtña, Guam 96910

Subject: Village Streets Repair First Quarter Report

Dear Governor Calvo:

*Buenas yan Háfa A'dai!*

The following report is the Department of Public Work's (DPW) FY 2018 first quarter status update on the village street repair program.

**FUNDING**

1. PL 34-42 Chapter 4 Section 1(j)(2) allocated \$1,854,435 for the purpose of funding village streets and road resurfacing and repairs in Fiscal Year 2018.
2. PL 34-44 *an act to amend* § Article 4, Chapter 26, Division 2, Title 2, Guam Code Annotated, relative to increasing the liquid fuel tax rates by four cents (\$0.04) per gallon; effective January 1, 2018, for the purpose of funding village road repair and construction projects signed into law on October 12, 2017. BBMR estimates this fund to amount to \$3.5M by end of calendar year 2018.
3. Governor approved an additional \$2M for road repairs.

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**QUARTERLY PROGRESS**

1. To date less than \$500 has been spent. Expenditures are limited to bid advertisements.
2. **IDIQ bid issued Oct. 12, 2017** for island wide village street repair.
  - a. The initial bid amount was not to exceed \$1.2M.
  - b. Pre-bid conference was held on Oct 24, 2017.
  - c. Bid request amended on Dec 12, 2017
    - i. to allow for regional pricing,
    - ii. **increase bid amount to \$3.2M** (money from DOI) and
    - iii. set new **bid opening** date from Dec. 15 to **December 19, 2017**.
3. The \$3.2M budget will pay for at least one street per village. The following is the village streets schedule:

<b>No.</b>	<b>Village</b>	<b>Street</b>
1.	Yigo	Gil Breeze
2.	Piti	Santate Lane (Nimitz Hill)
3.	MTM	Biang Street (MoongMong)
4.	Sinajana	Pale Kiren
5.	Agat	Duenas Street
6.	Agana Heights	Federico Street
7.	Umatac	Jose A. Quinata Street
8.	Barrigada	Gajuman Street
9.	Santa Rita	Namo Falls
10.	Talofofo	Paulino Heights (North and South)
11.	Yona	As Aguero Street
12.	Ordot-Chalan Pago	Chalan Anonas Street
13.	Mangilao	Tuno Kiko Feja Street (Pagat)
14.	Merizo	Demetrio Q. Meno Street
15.	Inarajan	Rt 4 Bele Street & Chaaminlago Intersection
16.	Dededo	Chalan Kareta Street
17.	Hagatna	Padre Palomo Street
18.	Tamuning	Carmen Memorial Drive
19.	Asan Maina	Sineso Field Street (Maina)

4. DPW's Highway Division with DLM's surveyors have begun sub-surface work at Gil Breeze on Dec. 12<sup>th</sup>.

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This is the first quarterly report highlighting DPW's progress on our village street repairs. Should you have any questions, please contact me at 646-3131.

*Un Dangkulo Na Si Yu'us Ma'åse!*



**GLENN LEON GUERRERO**  
Director

cc: *Lt. Governor Ray Tenorio*  
*Speaker Benjamin J. Cruz, 34<sup>th</sup> Guam Legislature*  
*Vice Speaker Therese M. Terlaje, 34<sup>th</sup> Guam Legislature*  
*Senator Frank B. Aguon, Jr., Committee on Guam-U.S. Military Buildup, Infrastructure and Transportation*  
*Mayor Paul M. McDonald, President Mayors Council*



**Department of Public Works  
Village Streets Management Strategy  
Report No. 17-09, December 2017**

## **ACKNOWLEDGEMENTS**

**Key contributions to this report were made by:**

Thomas Battung, Intern  
Christian Rivera, Accountability Auditor I  
Llewelyn Terlaje, CGAP, CGFM, Audit Supervisor  
Doris Flores Brooks, CPA, CGFM, Public Auditor

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**To ensure public trust and assure good governance,  
we conduct audits and administer procurement appeals,  
independently, impartially, and with integrity.**

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**The Government of Guam is the model for good governance in the Pacific.  
OPA is a model robust audit office.**

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**Professionalism: To adhere to ethical and professional standards.**

**Accountability: To be responsible and transparent in our actions.**

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- **Fax our office at 472-7951**
- **Or visit us at Suite 401, DNA Building in Hagåtña;**

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