

May 10, 2002

The Honorable Bill Purcell, Mayor
Mr. John W. Lynch, Acting Director
Department of Public Works
Metropolitan Government of Nashville and
Davidson County
750 South 5th Street
Nashville, TN 37206

Report of Internal Audit Section

Dear Mayor Purcell and Mr. Lynch:

We have recently completed a performance audit of the Department of Public Works. According to the *Government Auditing Standards* issued by the Comptroller General of the United States, “a performance audit is an objective and systematic examination of evidence for the purpose of providing an independent assessment of the performance of a government organization, program, activity, or function in order to provide information to improve public accountability and facilitate decision making by parties with responsibility to oversee or initiate corrective action.” A performance audit is different than a financial statement audit, which is limited to auditing financial statements and controls, without reviewing operations and performance. In performing this audit, we retained Maximus to work under our direction. Their

final report dated May 10, 2002, *Performance Audit of Department of Public Works*, accompanies this letter and is hereby submitted to you.

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Public Works is responsible for constructing and maintaining streets, roads, sidewalks and other rights-of-way and infrastructure; managing and administering a wide range of capital projects and the traffic and parking operations; and managing the waste collection and recycling programs. The primary divisions of Public Work are Engineering, Streets and Roads, Traffic and Parking, Waste Management, and Staff Services, which is responsible for financial, human resources, and other administrative support to the department. Public Works has a total of 538 budgeted positions for fiscal year 2002. Budgeted operating revenue was \$8,318,000. Budgeted personnel expense was \$22,124,000, and other budgeted expenses total \$69,872,000. Additional background information is included in Chapter 1 of the Maximus report.

Objectives, Scope, and Methodology

The last Public Works audit was issued in 1997. Attachment D to the Maximus report presents the implementation status of each of the previous audit recommendations. Many of those recommendations had not been fully implemented and are incorporated into the recommendations made in this report, as applicable.

The scope of the work excluded most of the Waste Management division because that division's operations had been included in the recent Metro-wide waste management study, the recommendations from which were being implemented during this audit. The Waste Management division's chipper operation, which was not included in the larger waste management study, was included in the scope of this audit. The audit focused primarily on fiscal year 2001 and 2002 financial transactions, performance and cost. Certain analyses required the consideration of financial results, performance and operations outside of that time period.

The primary objectives of this performance audit were as follows:

- Review all major aspects of Public Works operations, including assessing the efficiency and effectiveness of operations and the effectiveness of systems and controls in place to manage and communicate the results of operations.
- Compare Metro's operations and key performance measures to industry best practices and to selected peers.

- Assess the overall management of the Public Works Department, including organizational structure, staffing patterns, cost control, customer service, and information technology.

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- Assess compliance with applicable laws, regulations and policies.
- Determine the implementation status of past audit recommendations.
- Develop findings and recommendations for any areas where performance could be improved.

The methodology employed throughout this audit was one of objectively reviewing various forms of documentation, including written policies and procedures, financial information and various other forms of data, reports and information maintained by Public Works and other Metro departments. Management, administrative and operational personnel, as well as personnel from other Metro departments and other stakeholders, were interviewed, and various aspects of Public Works operations were directly observed. Data obtained from the various sources were analyzed, and various aspects of performance, cost and practices were compared to those of industry norms and to best practices.

We performed the audit procedures in accordance with generally accepted government auditing standards.

Findings and Recommendations

The Maximus report addresses Public Works operations and the resulting findings and recommendations in detail. Following is an overview of some of the more significant findings and recommendations included in their report.

- There is a general absence of cost and performance data throughout the department, limiting management's ability to analyze the efficiency and effectiveness of operations.
- Contracts are not always administered and managed to ensure compliance with contract terms and other requirements and to ensure payments are made in accordance with contract terms. The absence of a contract management system also hinders the department's ability to report to and answer inquires from elected officials, citizens and others.

- There are not enough staff or other resources dedicated to traffic control and sign maintenance to perform routine, preventative maintenance. Both areas operate in a reactive mode, correcting signal failures as reported. This approach results in poor service to citizens and can increase the risk of traffic problems.

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- The department does not have enough engineers on staff to fulfill development review responsibilities. Additionally, the Engineering Division is not organized in the most effective manner and has not been assigned sufficient responsibility for paving to ensure the technical aspects of the paving program are adequately managed.
- Preventative maintenance of streets is done primarily with pavement overlay, which is a costly approach. Implementation of an alternative program could reduce annual street preventative maintenance costs by \$2 million.
- The department does not always base maintenance and repaving scheduling on the street pavement condition ratings. Using the street ratings, along with managing and scheduling the work based on several maintenance districts established by such factors as traffic patterns and natural boundaries, would be a more effective and efficient way to maintain streets and roads. Additionally, making Public Works responsible for repairing all utility road cuts, with the utility reimbursing Public Works for the related cost, would help ensure the quality and timeliness of those repairs.
- The department had not implemented procedures and systems necessary to track and collect fees for temporary street closure, which would generate an estimated \$100,000 in revenue annually.
- There is a general absence of long-range planning in the department, notably in strategic planning, information technology planning and facility needs planning.

Detailed explanations of the above findings and the related recommendations, as well as several other findings and recommendations, are included in the Maximus report. The fiscal impact of the findings and recommendations can be summarized as follows.

- An increase in the annual operating budget of \$1.5 million is recommended. Increased staffing and supplies to address the deficiencies in traffic control and sign maintenance and in the Engineering Division, discussed above, account for \$1.2 million of the increase. The remaining increase is related to recommendations for enhancement of administrative staff positions and to correct problems noted in financial management and other administrative areas. Once audit recommendations resulting in savings and increased revenue are fully implemented, which should be by the 2003-2004 fiscal year, the department would save an estimated \$2.7 million from its operating budget annually.

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- Capital expenditures of \$1,526,000 are recommended for cost accounting and work order management systems, for a contract management system, and for additional vehicles and other equipment needed to enhance traffic signal maintenance. Additionally, a \$200,000 automated parking ticket system is recommended, and \$150,000 is recommended to assist in planning efforts.

A summary of each recommendation and the related fiscal impact can be found in Chapter 6 of the Maximus report.

Management's response to the audit recommendations is attached to this report.

We greatly appreciate the cooperation and help provided by all Public Works staff.

This report is intended for the information of the management of the Metropolitan Government of Nashville and Davidson County. This restriction is not intended to limit the distribution of this report, which is a matter of public record.

Internal Audit Section

Kim McDoniel

Internal Audit Manager

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Friday, May 10, 2002

Ms. Kim McDoniel
Metro Department of Finance
Internal Audit Division
222 Third Avenue North, Suite 401
Nashville, TN 37201

Dear Ms. McDoniel:

This letter is acknowledgement that the Department of Public Works has received the audit report recently completed by Maximus.

After thorough review of the report, the Department of Public Works is in agreement with its findings. We are determined to work diligently to address the issues raised in the report, and are committed to implementing its recommendations.

Sincerely,

John W. Lynch
Interim Director
Metro Public Works.

**PERFORMANCE AUDIT OF
DEPARTMENT OF PUBLIC WORKS**

**METROPOLITAN GOVERNMENT OF
NASHVILLE AND DAVIDSON COUNTY,
TENNESSEE**



May 10, 2002

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DEPARTMENT OF PUBLIC WORKS
Metropolitan Government of Nashville and Davidson County, Tennessee

I. INTRODUCTION AND EXECUTIVE SUMMARY

1. INTRODUCTION

The report presents a summary of issues developed by the project team regarding operations, organization and staffing of the Nashville and Davidson County (Metro) Public Works Department and recommendations for improvement. This is based on our review of the various departmental functions, including extensive interviewing both within the Department and with external agencies and data collection and analysis.

This report consists of several sections, as follows

Chapter I: Introduction

Chapter II: Streets and Roads Division

Chapter III: Chipper Division

Chapter IV: Engineering Division, including parking operations

Chapter V: Administrative Functions

Chapter VI: Conclusions and Implementation Plan

Appendix A: Departmental Profile

Appendix B: Best Management Practices Analysis

Appendix C: Comparative Survey

Appendix D: Analysis of Implementation of Prior Internal Audit Work

This first chapter provides an overview of the Department of Public Works and the analytical methodology the MAXIMUS project team used in conducting the analysis. We also provide a summary of key observations and recommendations that the report discusses in detail.

2. SCOPE OF PROJECT

Metro Nashville retained the services of MAXIMUS, Inc. to conduct a performance audit of Metro's Public Works Department, and to issue a report to the Department which summarizes all findings and recommendations resulting from field work and analysis. This assessment includes the Divisions of Staff Services, Engineering, Streets and Roads, Parking, and the Chipper Service located within the Waste Management Division. This project did not include all aspects of the Waste Management Division since Metro has recently completed a comprehensive waste management study of its waste management program. The assessment included a review and analysis of the following elements:

- All previous audit recommendations and studies performed in the Department to determine their appropriateness and the degree to which they have been implemented.
- The appropriateness of current staffing levels, and the methods of measuring employee performance and efficiency.
- Current work scheduling for all routine and special activities. This included an assessment of how overtime is used and controlled.
- A determination of which functions are performed in-house, and those that are outsourced. This included an assessment of the appropriateness of these practices and arrangements.
- The appropriateness of educational and certification requirements for professional staff, as well as training and development programs in place for support staff.
- The effectiveness of the current organizational structures within each of the Divisions, as well as for the Department of Public Works.

- Current operating effectiveness and cost of providing the significant services of each division. This included identifying any functions which could be combined or contracted.
- Significant service and construction contracts currently in effect.
- Financial controls over revenues and costs.
- The degree to which Public Works maintains an awareness of, and utilizes, available grants.
- The adequacy of technology systems, and their abilities to provide reliable and useful information to generate meaningful management reports.
- The effectiveness of right of way management.
- Planning, scheduling and management of Metro's infrastructure, taking into account legal and regulatory requirements and planning and engineering recommendations.
- Planning, scheduling and management of maintenance functions such as equipment repair, mowing, cleaning and other routine work elements.
- A determination of specific functions which are also performed in other Metro Departments, and the appropriateness of their placements in current organizations.
- An assessment of the deferred maintenance tracking systems in place.
- Current customer service systems, including the manner in which complaints are tracked, and the responsiveness of the Department to neighborhood and community concerns.
- A determination of how fees are established and reviewed for appropriateness.
- An assessment of the cost recovery systems in place for services provided by Metro which are outside its right of way.
- A review of the scope of Metro's storm water management study to determine whether other factors should be considered.
- A determination of the significant regulatory requirements with which Metro must comply, and the controls in place to ensure compliance.

- A determination of the controls in place to enforce developer compliance with Metro regulations and requirements, and the methods in place to correct deficiencies.
- An assessment of the employee safety program in place.
- A comparison of current traffic operations and systems with best practices and a determination of the effectiveness and appropriateness of the roles of the Department in managing traffic. This included an assessment of the appropriateness of the level of coordination with State and other entities involved in traffic control.
- A determination of the effectiveness of the Department's management of on and off-street parking operations.
- An assessment of the degree to which Public Works coordinates planned activities with other Metro agencies and other public and private entities.
- An assessment of the Department's long-range planning and budgeting processes and capabilities.
- An assessment of the security of grounds and facilities.
- A determination of the adequacy of inventory control systems in place.

Findings and recommendations resulting from the above work are included throughout this report.

3. PROJECT WORK PLAN

The MAXIMUS project team conducted the analysis using a methodology designed to obtain the maximum amount of Departmental participation, employee insight, and data collection and analysis within the project timeframe. Our specific work steps included:

- Developing an understanding of key issues within the Department through interviews with principal Department managers and Metro executive management. This included meetings and interviews with seven principal external Metro managers who have regular interaction with the Department, the Interim Department Director, and all Assistant Directors.

- Developing a detailed profile of the Public Works Department. This profile presented a summary of the organization, staffing, and operational procedures for the Department. It is based on interviews with all of the Department's management and supervisory personnel; interviews, field observation, and focus group meetings that involved nearly half of all of the Department's work force; and preliminary data collection. The project team prepared a draft profile and submitted to Metro for review. Metro staff submitted several suggested corrections, which the MAXIMUS staff have made. Attachment A to this report is the final version of the profile.

- We performed two different approaches to benchmarking best practices.
 - The first approach was a best management practice analysis, in which the project team identified key management practices within the Department and compared those practices against industry standards which we have observed over the many years of our consulting experience. The analysis of standards was drafted and reviewed with Metro personnel. Based on comments and responses, we modified the analysis to be as accurate as possible. The results of that analysis are included as Attachment B. The project team used both the comparative survey and the best practices analysis as guides in evaluating departmental operations and providing recommendations for improvement.

 - The second was a comparative survey of local governments that can be considered peers of Metro Nashville. The survey was designed to obtain, in a short period of time, comparative information relating to key activities of the Department of Public Works. Because of the wide disparity in the organization, operation, and budgeting of the various municipal operations, we did not attempt to make conclusive comparisons between the Metro Nashville Department of Public Works and the other jurisdictions. However, the comparisons do provide useful information relating to different service approaches and service levels. A copy of the survey results is included as Attachment C.

- Following these analyses, we prepared an issues list, in which we presented to Metro a listing of what the project team had preliminarily identified as key performance issues within the Department of Public Works. This issues list, together with suggestions provided by Metro staff for other issues, served as the core of our focused analysis.

- Based on the identified issues, we conducted detail analysis of staffing, work load and work performance, operational processes, and departmental organization as those relate to key performance. The analysis included detailed data collection, sampling of work data as appropriate, follow-up interviews, and the development of analytical models.

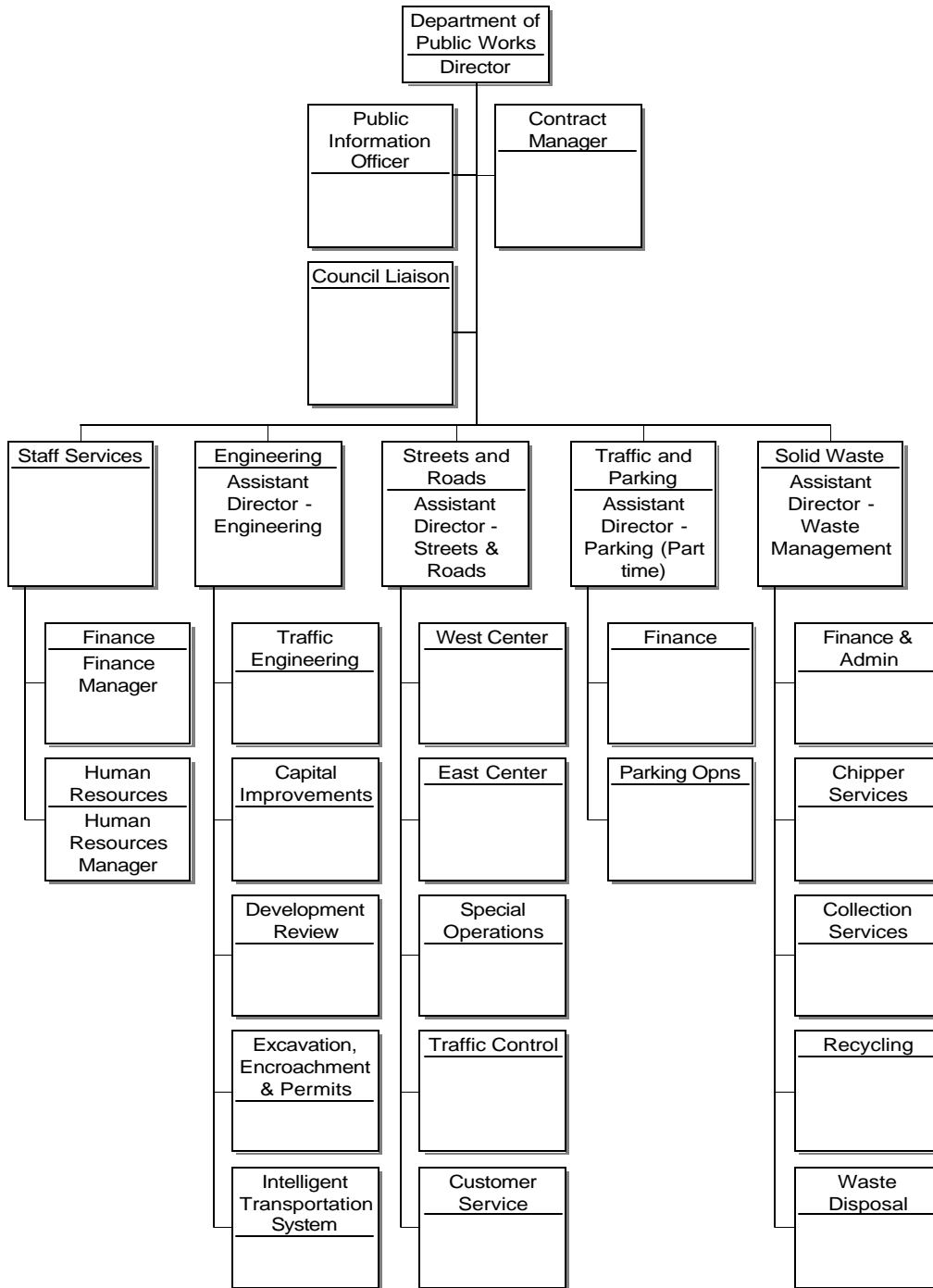
- We have drafted this report, which provides the results of our analysis, our recommendations for operational improvements, cost estimates relating to those improvements, and identification of key implementation issues.

4. OVERVIEW OF THE PUBLIC WORKS DEPARTMENT.

The Metro Department of Public Works is a traditionally structured and functioning department. Its principal responsibilities include

- Construction and maintenance of streets and roads
- Construction and maintenance of rights-of-way infrastructure such as curbs gutters, and sidewalks
- Traffic management traffic engineering and design, signs and signals
- Design, procurement, and management of capital projects
- Administration of parking, including parking meters and contract administration for Metro's parking garages
- Solid waste collection and management.

The chart on the following page presents the functional organization of the Department of Public Works. The Departmental Profile in Attachment A includes more detailed organization charts by division and staffing.



For the current fiscal year, the operating budget of the Public Works Department is \$91,996,487, exclusive of capital projects. Of this amount, \$32,195,767 is expended on solid waste operations. Two other major changes in departmental operating expenditures are occurring during this fiscal year. First, equipment operations is being transferred to a consolidated Metro Fleet Operations Department; the Public Works budget for this item is \$3,996,123. Second, the National Pollutant Discharge Elimination System (NPDES) staffing is being transferred to the Water Department. The budget for the storm water operations is \$1,438,096; however, this study recommends not transferring the full amount since the staff perform duties other than just storm water management. The Department projects revenues of \$8,318,358; as with operational expenditures, the majority of the revenue stream—\$6,688,774—is derived from solid waste operations. Expenditures and revenues are summarized in the following tables:

DEPARTMENT OF PUBLIC WORKS SUMMARY OF FY 02 OPERATING BUDGET	
Expenditure Item	FY 02 Budget Amount
Staff Services - Personnel	858,585
Staff Services - Other	370,307
Staff Services - Fringe	258,711
Engineering - Personnel	2,357,444
Engineering - Other	162,055
Engineering - Fringe	626,745
Operations/Maintenance - Personnel	5,909,769
Operations/Maintenance - Other	6,958,519
Operations/Maintenance - Fringe	1,522,066
Bridges - Personnel	329,700
Bridges - Other	10,500
Bridges - Fringe	84,399
Equipment - Personnel	1,773,196
Equipment - Other	1,732,015
Equipment - Fringe	490,912
Traffic & Parking - Personnel	443,790
Traffic & Parking - Other	50,418
Traffic & Parking - Fringe	126,821
Storm Water Quality - Personnel	334,546
Storm Water Quality - Other	1,019,586
Storm Water Quality - Fringe	83,964
Highway Safety Lighting - Other	45,000
Satellite Cities	223,112
GSD Chipper Service Transfer	935,978
USD PW Chipper Service Transfer	1,530,868

DEPARTMENT OF PUBLIC WORKS SUMMARY OF FY 02 OPERATING BUDGET	
Expenditure Item	FY 02 Budget Amount
GSD PW Solid Waste Transfer	9,262,121
GSD PW Recycling Transfer	4,136,159
GSD PW Disposal Fee	1,000,000
USD PW Refuse Collection Support	8,641,867
Subtotal of Solid Waste Transfers	25,506,993
Signal, Sign, Marking - Personnel	882,779
Signal, Sign, Marking - Other	1,078,323
Signal, Sign, Marking - Fringe	235,808
Street Cleaning - Transfer to Other	65,000
Street Cleaning - Personnel	1,004,241
Street Cleaning - Other	940,984
Street Cleaning - Fringe	264,181
Street Lighting - NES	4,050,251
Waste Management	32,195,767
Total	91,996,487

DEPARTMENT OF PUBLIC WORKS SUMMARY OF FY 02 OPERATING REVENUE	
Revenue Item	Budgeted Amount
GSD General	
Excavation Permits	200,000
Sidewalk & ROW Permits	1,000
Obstruction Permits	1,750
Meter Occupancy Permits	30,000
Temp Street Close Permits	100,000
Plans & Specifications	3,000
Garbage & Junk	2,100
Storm Water Mgmt Appeals	2,000
Parking	1,200,000
House Mover Escort	2,300
Other Transfers	69,044
Subtotal	1,611,194
USD General	
PW Refuse Collection Support	18,390
Subtotal	18,390
Waste Management Operations	
Total Fee for Service	6,558,499
Miscellaneous Revenue	130,275
Subtotal	6,688,774
Total of Department Revenues	8,318,358

5. PRINCIPAL RECOMMENDATIONS.

This report provides many different recommendations relating to the operation of the Public Works Department. Some have clearly defined cost implications, both for savings as well as needed additional costs; but, many are suggestions for improved work processes that, while not necessarily quantifiable, will have a significant overall impact on departmental efficiency and effectiveness when taken as a whole. In the concluding chapter, we list all of the recommendations, together with project fiscal impacts.

There are several recommendations, however, which are encompassing in scope, either by virtue of impacting all departmental operations or having significant expenditure requirements or cost savings. These are the recommendations on which Metro should focus its primary attention. They include the following:

- The Department needs to acquire and implement systems for both job management and contract management. In both cases, these should be efforts that are integrated with Metro's overall information technology strategies and coordinated with other Metro departments that also use such systems.
- The Department needs to completely redesign its approach to pavement management. Various recommendations include evaluation of the methodology by which it makes overlay decisions, relocating responsibility to Engineering, and implementing a slurry seal program whose estimated cost savings would be as much as \$2.0 million to \$4.7 million dollars annually when compared to current plans to expand overlay.
- Staffing and operations for signs and signal maintenance need to be greatly expanded, with significant additions to staffing. As part of the effort, the Department should develop a structured competition model in which it competes against private service providers when there is insufficient local private competition. This relates particularly to signal installation work.
- Engineering functions need to be reorganized in order to place greater emphasis on capital project design and management.
- Responding to the expanded sidewalk program will require the Department to develop a more systematic approach to the service, including designation of specific staff leadership and application of a project planning model.
- The Department should discontinue its chipper reservation system while expanding its regular capacity through specialized equipment.

These, and the other, recommendations are discussed in detail in the body of this report, beginning with a review of Streets and Roads Operations in the following chapter.

II. DIVISION OF STREETS AND ROADS

The Division of Streets and Roads provides a wide variety of services, including paving, patching, milling, street sweeping, alley cleaning, ditch cleaning and maintenance, mowing, concrete repair and maintenance, tree trimming and removal, vacant lot cleanup, traffic signal maintenance, sign fabrication, maintenance and installation, warehouse oversight, as well as other services and activities. This chapter of the report analyzes and provides recommendations in the operation and organization of the Division:

1. THE TRAFFIC CONTROL UNIT OF THE DIVISION OF STREETS AND ROADS IS INSUFFICIENTLY STAFFED TO ACCOMPLISH PREVENTIVE MAINTENANCE AND REPAIR OF METRO'S TRAFFIC SIGNALS.

The Traffic Control Unit of the Streets & Roads Division is responsible for repairing and maintaining approximately 800 traffic signals in Metro while it uses a private contractor primarily for new installations. Well planned and executed signal maintenance is important to Metro for several reasons. The first is that a properly operating system is essential for proper traffic flow, particularly in areas of high congestion. Improperly operating signals, or non-operational signals result in diminished traffic handling, often requires uniformed police officers to direct traffic in areas of congestion and results in repair call-outs on overtime. Additionally, signal failures create a potential liability to Metro if they are causal in traffic accidents and personal injuries.

Signal maintenance is accomplished through staff located in the Signal Maintenance and Signal Construction units of the section. Specifically, these staff positions are listed in the table below:

Staff Assigned to Signal Maintenance and Repair

Signal Construction Unit	Signal Maintenance Unit
Signal Technician III (3)	M&R Leader III
Signal Technician II (3)	M&R Leader II
	M&R Worker III
Signal Technician I (2)	M&R Worker II (2)
Total = 8	Total = 5

As can be seen in the table above, there are a total of 13 field traffic technician positions responsible for the maintenance and repair of Metro’s signalized intersections. With approximately 800 signals, this equates to a signal to technician ratio of 61.5 to 1. Industry standards indicate that this ratio should be within the range of one technician per 30 to 35 signals, indicating that the Units require approximately 22 to 26 technicians, or between 9 and 13 additional staff.

This apparent staffing deficit is validated in part through an analysis of Traffic Control Section records for its re-lamping program. The Signal Maintenance Unit maintains manual records of signals, their intersection locations, the numbers of 60W, 90W and 120W bulbs at these locations, and the dates of re-lamping at these intersections. The project team reviewed these records and found that none of the approximately 800 intersections received “proactive” bulb replacement during the 12 months ended 12/31/01, although interviews indicate that the section “targets” an annual replacement of each bulb to ensure maximum reliability and operability of the system. Any replacements performed were accomplished as bulbs failed.

In addition to the re-lamping program, the Traffic Control Section performs preventive maintenance (PM) on control cabinets, which includes checks of timing information, general condition checks of the remote cabinets, cleaning of cabinet housing, checking of controllers, conflict monitors, and other activities. The Traffic Construction Unit targets a preventive

maintenance cycle of once per two years for each cabinet. Data obtained from the Unit indicate that 242 preventive maintenance events occurred in 2001, indicating that, if this number is indicative of previous years, each cabinet is on a PM cycle of once per 3.3 years.

The relatively low number of preventive maintenance occurrences is an indication of the low staffing level of the Traffic Control Unit. In the experience of the project team, not only is the current actual PM level of once per 3.3 years too infrequent based on industry standards of performance, but the targeted service level of once per 2 years is less frequent than recommended. This targeted service level should be at least once per year, with some cities targeting a level of twice per year to ensure optimum system reliability. The risk to Metro in terms of the increased liability for accidents caused by signal inoperability indicates that this problem should be addressed immediately. Although data are not available to assess whether accidents have been attributable to this lack of preventive maintenance in the past, this lengthy cycle of preventive maintenance indicates that the potential exists to be problematic in the future.

An additional indicator that the two units are insufficiently staffed is in the lack of record-keeping regarding the system reliability. Specifically, the Traffic Control Unit should be able to report the percentage of time each signal is operable, and the reasons for system failures, with a determination as to whether the failure was preventable or non-preventable. This is not possible in Metro's Traffic Control Unit as the Division's work reporting system does not track this data.

Recommendation 2-1. The project team recommends that the Traffic Control Section significantly increase staff in order to initiate, and continue to provide on an ongoing basis, a preventive maintenance program which will allow the Section to proactively maintain Metro's 800 signalized intersections, as well as to maintain records regarding system reliability. An estimate of the cost to minimally staff the Signal Maintenance and Construction Units is approximately \$405,500 in operating costs. Of this amount, an

estimated \$76,500 would be increases in supplies and materials, and \$329,000 would be in personnel costs, as is shown in the table below. We anticipate that the new personnel will require up to three bucket trucks, for a capital cost of \$300,000 based on Metro's most recent bids. It is expected that the potential benefits will include a reduction in repair callouts, improved traffic flow, and reduction in liability exposure.

Given that only approximately 0.5 FTE's are performing proactive cabinet PM's, a significant percentage of the additional staffing may need to be allocated to this function. It is assumed in the table that, of the recommended 9 new employees, 5 are Signal Technician I's, and 4 are M&R Worker II's.

Calculation of Costs Associated with Additional Traffic Technicians

Position	Additional Number Needed	Salary at Midpoint	Extended Salaries at Midpoint	Benefits (at 30%)	Total Direct Cost
Signal Tech. I	5	\$31,470.40	\$157,352.00	\$47,205.60	\$204,557.00
M&R Worker II	4	\$23,857.60	\$95,430.40	\$28,629.12	\$124,059.52
Total	9	\$55,328.00	\$252,782.40	\$75,834.72	\$328,617.12

Therefore, as the table shows, the project team recommends that the Section add staff with an annual estimated cost of approximately \$329,000 plus \$300,000 for additional bucket trucks.

The estimate for an increase in supplies and materials is based on the current budget for repair and maintenance supplies in the Signal, Signs, and Markings Unit, less expenditures for signs divided by the number of current signal crew personnel. This equates to an average of \$8,500 per staff person. At the same ratio, the addition of nine personnel would increase material costs by \$76,500, for a total increase in costs of \$405,500. This will also require additional equipment; we estimate the need for three bucket trucks at \$100,000 each, based on the City's most recent purchases.

Recommendation 2-2. The capability to track signal operations and reasons for system failure should be incorporated into Metro's proposed Intelligent Transportation System data collection and reporting. There should be no additional cost associated with this recommendation through incorporation into the grant-funded ITS. This information should also link to a work order management system, discussed later in this chapter. The benefit of this information is that it will permit Department management to monitor signal activity on a regular basis, track outages, and prepare work plans to address systematic problems.

2. THE TRAFFIC CONTROL SECTION SHOULD BEGIN THE PROCESS OF BIDDING ON SIGNAL INSTALLATIONS TO ENSURE A MORE COMPETITIVE ENVIRONMENT, AND TO ENSURE A MORE COST-EFFECTIVE PROCUREMENT OF THESE SERVICES.

Interviews and analyses of contractual documents indicate that traffic signal installations have been historically provided by a single private entity. This situation has resulted in non-competitive procurement of services, and has reportedly resulted in relatively lengthy installation periods, especially within the recent past. Although the project team did not have access to data indicating the exact amount expended for labor services in providing the installations (figures available through the Department's Staff Services unit reflected total prices, inclusive of materials and labor) the total amount expended in signal installations was over \$1.7 million since mid-1998.

The Traffic Control Section does not currently possess the personnel resources to install traffic signals; further, there are indications that it is unlikely that there will be sufficient numbers of competitors in this field to ensure the existence of a competitive environment in the foreseeable future in Metro. Therefore, for reasons of flexibility as well as potential cost-effectiveness, the project team recommends that, at the time of the next bid cycle for signal installation services, the Traffic Control Section submit a "bid" to provide these services internally, much in the same manner that any other private concern would submit its own. This

competitive model, first developed in Phoenix, enables a City department to offer its services in a competitive environment. There are several advantages to this approach:

- It creates a competitive environment where historically there has been only a single service provider; it puts the provider on notice that its pricing needs to be competitive and its service needs to be responsive.
- The model enables Metro to evaluate whether it can provide the service more efficiently and effectively than the private provider without having to make a commitment to staffing and equipment acquisition prior to undertaking the service.

Recommendation 2-3. Allow the Traffic Control Section to submit a “bid” for the installation of traffic signals as a measure to create a more competitive environment for this service. Typically, this approach to competition has the result of reducing costs for the same level of service by approximately ten to fifteen percent. Based only on existing, open purchase orders with the current service provider, we estimate that this approach would yield savings of about \$54,000 per year.

Normally, the MAXIMUS project team would develop a staffing and work model for a recommended organization. However, to do so here would place the Department at a competitive disadvantage, since potential competitors would then know the pricing it must beat. Therefore, for the purposes of implementing this recommendation, the Department should not assemble any “bid based” information until Metro is ready to seek new bids for the service contract and should then prepare its proposal as if it were a private service provider.

The next issue analyzes the staffing levels of the Signs and Markings Unit.

3. SIMILARLY, THE SIGNS AND MARKINGS UNIT IS INSUFFICIENTLY STAFFED TO PROVIDE PROACTIVE MAINTENANCE OF METRO’S STREET SIGNS.

The Signs and Markings Unit of the Traffic Control Section maintains and repairs approximately 86,000 street signs in Metro with one Signs and Markings Supervisor (who expends approximately 50% of time in road striping oversight) and three M&R Worker III’s.

This equates to an approximate ratio of 24,570 signs per field worker, assuming 3.5 equivalent field workers.

As with signalization, the proper maintenance of street signs is important for proper traffic flow and traffic safety. Missing or improperly reflectorized signs can result in drivers getting lost and making improper traffic movements and can create potential liability situations for Metro if those movements result in traffic accidents and/or personal injury.

The project team noted two concerns regarding the staffing and operations of the Signs and Markings Unit. These can be summarized as follows:

- **Each crew member is responsible for maintaining a relatively large number of signs.** – As noted above, each of the crew members in the Signs and Markings Unit is responsible for approximately 24,570 signs. In the project team’s experience, this is an unusually large number, as the “norm” is generally in the 8,000 to 12,000 range. This large number of signs for which each crew member is responsible is forcing the Unit into a reactive mode of operation. As an illustration, the Unit responded to a total of 5,488 requests for new sign installations, modifications and repairs in 2001. If each of these requests requires travel time and actual on-site work equating to one hour, this would have required 5,488 person hours of the 3.5 employees. If each of the employees works an average of 1,650 productive hours each year, this results in a capacity of 5,775 productive crew hours, leaving approximately 287 hours (or about 82 per year, per employee) for proactive efforts relating to the checking of sign reflectivity, administrative reporting, and other activities. Assuming that each crew member is responsible for 12,000 signs, this would equate to the need for a minimum total of 7 crew members. Given that one of these crew members is 0.5 FTE, this would require 4 additional employees. The project team raises the issue of the feasibility of increasing the numbers of employees allocated to sign maintenance and repair.
- **There is no automated inventory of signs in Metro.** – Although the Unit maintains a manual history of sign repairs performed, this is not automated. Therefore, it becomes a manual process of retrieving information related to maintenance histories, locations, sign types at specific locations, and dates of required maintenance.

As the preceding discussion indicates, the project team has noted significant concerns in the Signs and Markings Unit operations. At issue is the high workload per employee which is

resulting in the “reactive” mode of operations in the Unit. As noted above, each of the crew members in the Signs and Markings Section is responsible for maintaining over 24,000 signs. In itself, this is not a particularly meaningful figure until compared to other jurisdictions with which the project team has experience. This experience indicates that crew members should be responsible for approximately 8,000 to 12,000 signs, or about one-third to one-half of the number of Metro’s crews. As further evidence, Signs and Markings crews replaced 3,903 signs in 2001, or about 4.5% of the total. This implies that each sign is replaced once per 22 years, which is well beyond the typical sign’s reflectivity life cycle, and is an indication that the Unit is simply replacing signs as they are damaged or destroyed. The continued replacement of signs over such a protracted period exposes the Division, Department and Metro to the possibility of faded or damaged signs being illegible, leading to potential accidents or, at a minimum, inconvenience to motorists. Signs which have been vandalized or, worse, removed, without the prompt attention of Traffic Control staff could result in accidents which may have been preventable had sufficient staff been deployed in a more proactive manner.

Recommendation 2-4. The project team recommends an increase of four M&R Workers in this Unit to accomplish routine sign maintenance and repair, inventory collection and maintenance, and proactive determinations of those signs in need of repair. The following table provides a calculation of salary and benefits related to “full staffing” of the Signs and Markings Unit, assuming that each sign crew is staffed with a M&R Worker II or III. The estimated cost of this recommendation is approximately \$204,059 in operating costs for personnel and materials; of this amount, \$124,059 would be for additional personnel, and \$80,000 for supplies and materials. In addition to the operating costs, there would be an estimated capital cost of \$125,000 for additional vehicles. The commensurate benefit is improved traffic movement and safety and reduced public liability.

Preliminary Cost Calculation for “Full Staffing” of Signs & Markings Unit

Position	Additional Number Needed	Salary at Midpoint	Extended Salaries at Midpoint	Benefits (at 30%)	Total Direct Cost
M&R Worker II	4	\$23,857.60	\$95,430.40	\$28,629.12	\$124,059.52

As shown in the table above, the estimate to fully staff the Signs and Markings Unit of the Traffic Control Section of Streets and Roads is approximately \$124,060.

Based on a review of accounts payable, the Department paid \$111,863 for signs and materials in the past fiscal year. This is an average of \$15,980 per sign staff. The addition of four more staff would increase the materials spending by \$63,920. Anticipating greater work productivity, we recommend estimating a total of \$80,000 for additional materials.

Depending upon the availability of vehicles in a restructured Fleet Maintenance Division, the Signs and Markings Unit may additionally require the purchase of new vehicles to accommodate the transportation needs of the new employees. These expenses could be as much as \$125,000 for four vehicles, which should be equipped to carry signs, posts, and equipment related to the installation and repair of the signs.

Recommendation 2-5. The project team recommends that the Department develop an automated inventory of signs maintenance. At a minimum, this could be an internally developed Access database; however, more ideally, this should be part of a master work order and control system, discussed later in this chapter. As a local data base, this recommendation has no cost implications. The overall costs of a work order system are discussed later in this chapter. The benefits of this recommendation are improved management of work and inventory, resulting in a more efficient use of personnel and a more effective sign maintenance program.

The next issue discusses the internal organizational structure of the Traffic Control Section.

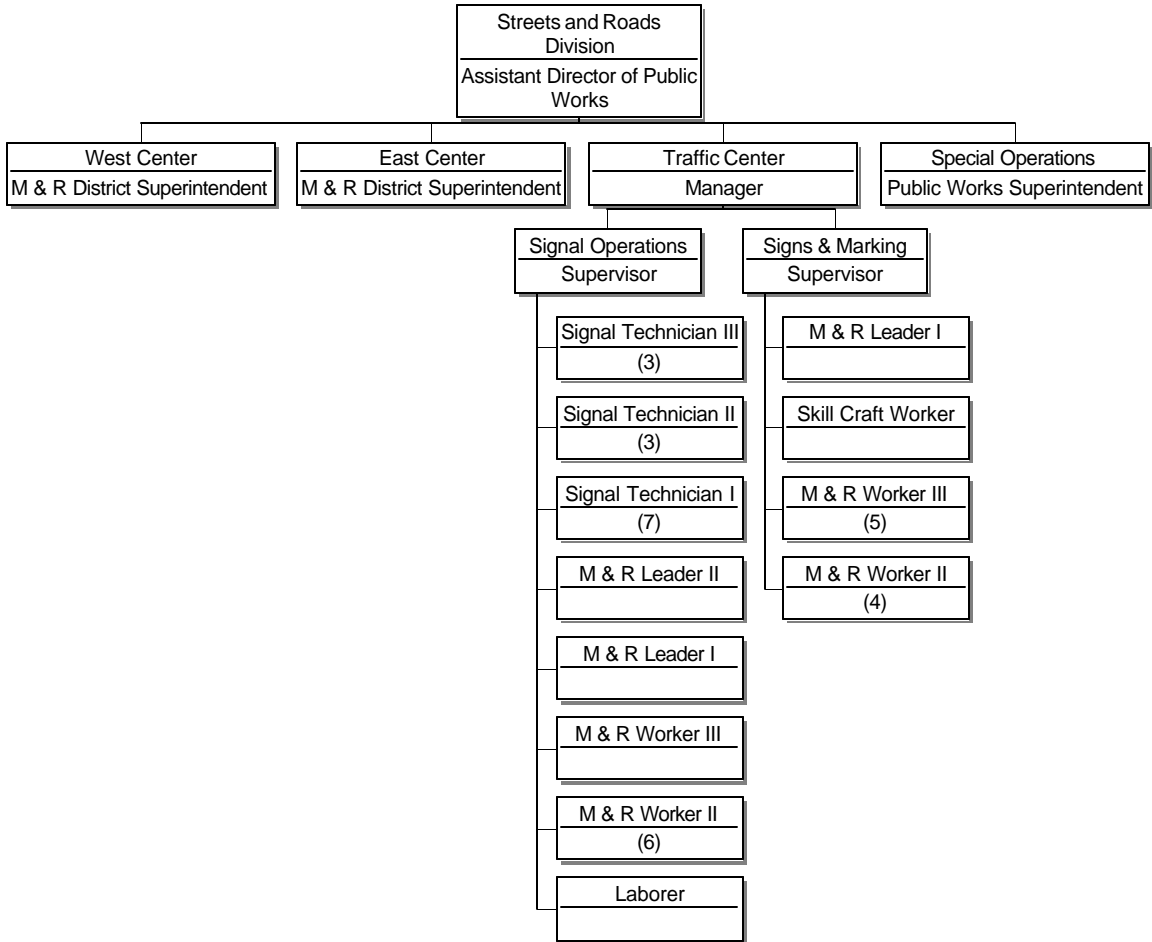
4. **THE TRAFFIC CONTROL UNIT SHOULD CONSOLIDATE THE CURRENTLY-SEPARATE SECTIONS OF SIGNAL CONSTRUCTION AND SIGNAL MAINTENANCE.**

Currently, the positions of Signal Maintenance Supervisor and Signal Construction Supervisor oversee separate sections which perform activities related to the maintenance and repair of traffic signals. Although these two sections require employees possessing separate skills, the management of these units requires a coordination of effort to ensure that preventive maintenance is performed in accordance with a pre-established plan. Further, many calls for service currently handled by Signal Technicians in the repair and maintenance of controllers, wires, etc., could be combined with functions now performed by the Signal Maintenance Unit, such as bulb replacement, control box change-outs, and potentially other activities.

The issue here is not one of the elimination of functions, but rather of consolidation of managerial efforts. In the experience of the project team, it is common to combine the management of these two disciplines under a single management structure while recognizing the need for a separation of duties performed by field staff.

Recommendation 2-6. The project team recommends combining the two currently separate disciplines of signal construction and signal maintenance. The consolidation of these two functions will allow the reduction of one of the Supervisor positions with an estimated cost saving of approximately \$57,800 annually in salary and benefits. The proposed, revised organizational structure is presented in the chart on the following page. Note that the new organization chart contains the recommended positions discussed in the two previous sub-sections, above.

**RECOMMENDED ORGANIZATION
STREETS AND ROADS DIVISION
TRAFFIC CONTROL UNIT**



The next issue provides an analysis of costs associated with the in-house milling function provided by Special Operations.

5. THE IN-HOUSE MILLING OPERATION APPEARS TO BE COST-EFFECTIVE, BUT DATA PROBLEMS PRECLUDE ABSOLUTE DETERMINATION.

The project team analyzed the cost-effectiveness of the in-house milling operation, and has questions regarding its cost-effectiveness in comparison to private sector costs. The cost of milling was analyzed by sampling three months of data (July through September, 2001) during which varying amounts of milling were performed. The direct labor costs and associated benefits shown in the table below are reflective of the three months in the sample. However, as equipment-related costs tend to vary significantly from month to month, a two-year sample was obtained for repair and maintenance parts and labor charges. These costs were divided by 24 (to reflect an average month of costs), and added to the labor-related charges, then divided by the square yards of milling accomplished in the sample month. The results are shown in the following table:

**Calculation of In-House Milling Cost
Based on Sample of July, August and September, 2001 Work Activity**

Element	July, 2001	August, 2001	September, 2001
Labor hours expended in milling	1,466	3,325	301
Labor Costs (as reflected in time sheets)	\$18,852.68	\$41,316.29	\$3,870.84
Benefits Cost (at 30% of salaries)	\$5,655.80	\$12,394.88	\$1,161.25
Maintenance and Repair Costs	\$3,892.15	\$3,892.15	\$3,892.15
Parts Costs	\$6,347.47	\$6,347.47	\$6,347.47
Contracted Repair Costs	\$367.80	\$367.80	\$367.80
Depreciation Costs	\$8,789.34	\$8,789.34	\$8,789.34
Total Costs	\$49,561.04	\$78,763.73	\$30,084.65
Square Yards Milled	87,780.1	102,220.0	38,758.8
Cost per Square Yard	\$0.56	\$0.77	\$0.78
Typical milling costs from private contractors (for 2" mill depth, inclusive of debris hauling charge of approx. \$0.25/sq. yd. – Range is dependent on length of segment, numbers of valve boxes in stretch, etc.).	\$0.75 to \$1.00 per square yard		

As the table shows, the calculations of milling costs for in-house crews vary from July, when a relatively high number of square yards were milled, to September, when a relatively few were milled. To some degree, this difference may be explained by allocating fixed monthly maintenance and depreciation costs to the workloads. In other words, the same amount of depreciation, maintenance and parts charges were allocated to September's activity as were allocated to July's. However, there is also a large variation in productivity of crews, given that there were approximately 60 square yards milled per person hour in July, but only 31 in August. The relatively low figure in August may be explained by the fact that the paving crew assisted heavily in milling operations that month in cleaning up debris and production materials left by the milling crew. This is a routine occurrence during months in which the paving machine is out of operation, or that there is little paving to be completed.

The variations in productivity, combined with the fixed allocations of maintenance and depreciation charges, make comparisons to the private sector difficult in the case of the milling operation. As can be seen from the table, private contractors' costs vary (as do those of Metro crews) with the characteristics of the road segment being milled. However, the three months of data collected by the project team indicate that, for longer stretches of road milling, Metro crews appear to be somewhat less costly than private contractor operations.

It should be noted that the actual reported work data for September was incorrect in that it reported square yardage rather than square footage. The analytical figure in this report of 38,758 square yards milled in September was assumed, based on conversion from reported yards. This value is within a reasonable range for the 301 hours expended in the effort. Although this adjusted figure is assumed to be correct, it should be noted that the error has been allowed to stand since September, 2001.

It should also be noted that, as was the case for the paving crew in August, the milling crew is not utilized strictly in the milling of road segments, but rather is deployed in various activities when not performing milling work. Although there were several functions performed by individuals within the "milling crew" when not milling, these functions tended to be related to the concrete sidewalk pulling and construction. Given that the average crew size for the milling crew is approximately 11 members, the typical milling crew member expended approximately 118 hours per month in milling in the months of July, August and September, 2001. Viewed another way, approximately 8.1 full time equivalent (FTE) personnel were engaged in milling in these three months.

To some degree, the wide variations in productivity and utilization of crews may be a function of the lack of planning of effort. As the milling crew's efforts correspond somewhat directly to the paving function, this is less likely to be the case than in some other functions of the Division, as the paving effort is one of the few which appear to be planned to some degree. The milling function, like the paving effort, is subject to weather conditions, and, as is frequently the case in the Streets and Roads Division, is also a function of the reliability of the milling machine.

Recommendation 2-7. Given the variance in the cost figures for milling, the project team does not, at this time, make a recommendation regarding the retention or outsourcing of the function. Rather, it is recommended that the Division begin capturing and analyzing data over the next 12 months to establish a basis for comparison to private providers, and to determine if there are certain characteristics of the in-house operation which make it either more cost-effective than private providers, or if there are characteristics of certain jobs which make obtaining bids from private contractors difficult or impossible. If data analysis indicates that this function is not cost-effective, the Division would be recommended to re-deploy approximately 8.1 FTE's in other areas. Given that the employees currently in the milling crew perform other functions throughout the year, this would allow the Division to enhance services in other areas, such as in concrete replacement and inspection. If the cost analysis holds after the collection of valid data, it would appear that the milling operation is effective, when compared to private contractors.

It should be further noted here that the project team recommends that the Department greatly expand its slurry seal program as a preventive maintenance measure. This is discussed in greater detail in Chapter 4 of this report. This recommendation will result in a proportional reduction in the requirement to overlay streets, as is currently done. Given that the full implementation of the slurry seal program will take between 12 and 24 months, the project team recommends the retention of the milling function for that duration of time. At that time, it is recommended that the Streets and Roads Division re-evaluate the cost-effectiveness and productivity of the milling crew. If the volume of work and cost-effectiveness do not warrant the retention of the milling crew after the full implementation of the slurry seal program, the project team recommends its elimination, with the transfer of the approximately 8.1 FTE's to other functions in the Department.

The next issue discusses the cost-effectiveness of the in-house paving operation.

6. THE IN-HOUSE PAVING OPERATION IS SIMILAR TO THE MILLING OPERATION IN THAT THERE IS WIDE VARIABILITY IN ITS COST-EFFECTIVENESS BETWEEN PERIODS.

Interviews indicate that the paving crew in the Special Operations Unit of the Streets and Roads Division attempts to provide paving of streets which are of little interest to private contractors due to the presence of short paving segments or obstructions in the roadways which do not allow for continuous, uninterrupted work activities which promote maximum productivity. This assertion is only partially validated by analyzing the tons of asphalt poured per day in the months of May and July, 2001.

Specifically, in the project team's experience, highly productive paving crews pour an average of between 500 and 700 tons of asphalt per day when examining an extended time period of activity. This range takes into account an equal number of road segments containing impediments as those which allow for uninterrupted activity. In analyzing the productivity of Metro's paving crew, the overall two-month average for May and July, 2001 was approximately 431 tons per day for the 15 days on which paving was performed. Again, however, there was a very large variance in productivity, and resulting cost-effectiveness. The table below calculates only the labor and equipment cost per ton of asphalt laid (it does not include materials cost):

**Calculation of Paving Productivity
May and July, 2001
(Does not include cost of asphalt)**

Element	May, 2001	July, 2001	Total
Salaries and benefits	\$7,249	\$17,028	\$24,277
Equipment depreciation	\$15,494	\$15,494	\$30,988
Subtotal	\$22,743	\$32,522	\$55,265
Tons of asphalt laid	4,332.49	2,138.18	6,470.67
Salaries and Equipment Cost per ton	\$5.25	\$15.21	\$8.54
Contractor Cost	\$10.00 to \$11.00 per ton		

The figures in the table reflect a significant variance in the variable costs associated with pouring each ton of asphalt, suggesting that the characteristics of the street segments paved were vastly different between the two months. In support of this observation, although the overall number of tons poured per day was 431, as noted above, the figure for May was 866 tons per day, and was 214 tons per day in July.

In contrast to the analysis of the milling operation, above, the analysis of cost and productivity in the paving function points to more definitive conclusions. These include the following:

- Although the cost and productivity per ton of asphalt poured in May are within the normal ranges for paving operations, the figures suggest that, contrary to the Division's assertions, in-house paving crews are at least at times utilized to pave street segments with characteristics similar to those which were reported to be reserved for the private sector.
- Although the cost and productivity figures for July are reflective of characteristics of roadways which the Division has indicated are reserved for in-house crews (i.e., short, interrupted segments), there was an almost negligible number of tons poured, calling into question the value of retaining the in-house crew.

To summarize, the in-house paving crew provides services at cost and productivity levels similar to, but no greater than, those available in the private sector when performing work on similar street segments. On the other hand, the in-house crew displays very low productivity levels on street segments which do not allow great economies of scale.

Recommendation 2-8. On a strict cost-effectiveness basis, the project team does not recommend the elimination of the paving function at this time. However, as was noted above in the analysis of the milling function, the project team recommends that the Department greatly expand its slurry seal program as a preventive maintenance measure. This is discussed in greater detail in Chapter 4 of this report. This recommendation will result in a proportional reduction in the requirement to overlay streets, as is currently done. Given that the full implementation of the slurry seal program will take between 12 and 24 months, the project team recommends the retention of the paving function for that duration of time. At that time, it is recommended that the Streets and Roads Division re-

evaluate the cost-effectiveness and productivity of the paving crew. If the volume of work and cost-effectiveness do not warrant the retention of the paving crew after the full implementation of the slurry seal program, the project team recommends its elimination, with the transfer of the employees in the paving crew to other functions in the Department.

As discussed in the section on a slurry seal program in the Engineering Chapter, it is expected that the Department will hire a professional consulting firm to assist in the development of the program. The evaluation of any retention of paving functions within the Department would be an appropriate consideration in the development of the subsequent final program.

7. WORKLOADS ARE UNEVENLY DISTRIBUTED BETWEEN THE EAST AND WEST SATELLITE CENTERS.

In addition to the central location at South 5th Street, from which the Special Operations Section operates, the Streets and Roads Division of Public Works has two satellite centers from which field crews are dispatched to work sites. These are the East and West Centers, located at 941 Dr. Richard Adams Drive, and 3800 Charlotte Pike, respectively.

The work activities, as well as the staffing levels, at the two satellite locations are generally the same, with the exception that cemetery burials are performed at the East Center.

The crew descriptions and staffing levels are presented in the table below:

Staffing and Functions at the Satellite Centers

Crew	East Center Staff	West Center Staff
Shoulder Maintenance & Construction	9	8
Tree Removal	9	9
Construction	6	8
Patching	6	6
Masonry	4	4
Storm Sewer	6	8
Mowing	6	3
Median	3	4
Street Cleaning	3	3
Vacant Lot Cleaning	8	8
Total Staff	60	61

Interviews indicate that, at the time the responsibility areas were allocated between East and West Centers, an attempt was made to evenly distribute the workloads based on similar numbers of street mileages. The project team obtained the lengths of street segments within each of the Councilmanic Districts, and utilized this allocation for validation purposes. This appeared to be a reasonable proxy for responsibility area allocation, as workloads are reported daily based on this designation. Although three Council Districts (12, 19 and 20) appear to be split between the East and West Centers, there is generally a clear definition of which Council District is allocated to each of the two Satellite Centers, as the table below shows.

**Allocation of Council Districts and Linear Feet of Roadways
between East and West Centers**

East Center		West Center	
Council District	Linear Feet of Road	Council District	Linear Feet of Road
1	790,868	12 (50%)	176,712
2	300,949	13	258,287
3	339,515	16	294,414
4	281,405	17	213,851
5	226,268	18	145,521
6	218,927	19 (50%)	153,604
7	260,652	20 (50%)	143,431
8	256,491	21	286,788
9	308,795	22	225,107
10	380,486	23	417,998
11	340,665	24	330,587
12 (50%)	176,713	25	285,425
14	243,162	26	223,927
15	499,034	27	247,943
19 (50%)	153,604	28	264,192
20 (50%)	143,431	29	391,614
		30	190,874
		31	363,770
		32	298,226
		33	239,585
		34	223,279
		35	361,799
Total	4,920,965	Total	5,736,934

As can be seen from the table, if Council Districts 12, 19 and 20 are split evenly between the two Centers, the East Center has responsibility for 14.5 Council Districts and the West

Center has responsibility for 20.5. Further, the West Center has responsibility for approximately 53.8% of all paved roadway maintenance, versus approximately 46.8% in the East Center.

The project team noted during the preliminary data analysis that many of the metrics reported in the monthly reports indicated that the West Center accomplished a greater level of output than did the East Center. In following up on this preliminary indicator, the project team requested and received from the Metro Information Technology Department a summary of the Automated Inquiry Management (“AIM’s”) system work orders by Council District for 2001 to determine the degree to which these work requests validated the disparity in workloads. The results showed that, in many cases, the variances in work requests between Centers are significant, as the table below shows.

**AIM’s Work Orders by Center
For Selected Category Codes**

Category	East Center Work Orders	West Center Work Orders	Total Work Orders
Ditch Maintenance (#101)	681	852	1,533
Patching (#103)	207	281	488
Tree Removal (#106)	484	837	1,321
Emergency Calls (#134)	446	509	955
Debris Clean-up (#137)	798	909	1,707
Dumpsite Clean-up (#138)	774	235	1,009
Total All AIM’s Work Orders	7,831	9,412	17,243

Note: The Ditch Maintenance function has been transferred to the Water Department.
 Note: During the period for which these data were collected, Metro was experiencing severe storm conditions on the west side of the City; response to these storm conditions explains, in part, the higher volume of West Center work related to tree removal, emergency calls, and debris removal.

Note that, since not all AIM’s work categories are reflected in the table, the totals for the six categories that are shown in the table do not sum to the overall total of 17,243 work requests received during the year. These six categories do, however, represent approximately 60% of all work requests for which the two Centers could have been expected to respond. (After HazMat, milling, paving, and sign repair work requests, for example, have been omitted from the totals.

These are functions under the responsibility of other sections in the Division). Therefore, these six categories are representative of the allocation of work between the two centers.

Highlights from an analysis of the table indicate the following:

- The West Center received approximately 55% of all ditch maintenance requests, or 25% more than the East Center.
- The West Center received 58% of all Patching requests, or 36% more than the East Center.
- The West Center received 63% of all tree removal requests, or 73% more than the East Center.
- The West Center received 53% of all Emergency Calls, or 14% more than the East Center.
- The West Center received 53% of all calls for Debris Clean-Up, or 14% more than the East Center.
- The East Center, however, received 77% of all calls for Dumpsite Clean-Up, or 229% more than the West Center.
- Overall, the calls for work activities in the West Center accounted for approximately 54.6% of the total, although, as noted above, the two Centers did not have responsibility for the responses to a significant percentage of the total.

Aside from the wide variance in the numbers of dumpsite clean-up calls, the West Center appears to be responding to a significantly greater number of AIM's work requests than is the East Center. Given that the staffing levels at the two Centers are similar, it would follow that the East Center, with a lower number of AIM's work requests which, by nature require a *reactive* approach to maintenance, should be generating greater volumes of *proactive* work output. In analyzing the degree to which this is actually occurring, the project team reviewed the monthly reports, which report output levels for certain work types, and noted those categories which could be classified as proactive. Although this is not a clear definition, and certainly not one

used by the Department, the project team evaluated each of the reported metrics and determined that the “proactive” work elements (i.e., those which are generally not performed in response to a complaint, but rather performed as a part of a routine service) include the following, along with the annual totals of work output by Center.

“Proactive” Work Output Metrics by Center

Reported Metric	East Center Volume	West Center Volume
No. of Inlets Cleaned	2,790	2,718
Headwalls Built	102	118
Shoulders Constructed	631,836 ft.	487,164 ft.
Rights of Way Trimmed	303.4 miles	374.4 miles
Rights of Way Mowed	2,854.7 miles	4,343.8 miles

The figures in the table do not indicate that the East Center is accomplishing a volume of “proactive” work sufficient to compensate for the significantly lower “reactive” call volume received through AIM’s work requests. On the contrary, taking the mowing activities as an indicator, the West Center is mowing its area of responsibility approximately 4 times per year. In contrast, the East Center mows its area of responsibility approximately 3 times per year.

Finally, to verify whether there is, in fact, an inequitable workload distribution, or whether the East Center is simply transferring personnel into West Center areas of responsibility on a daily basis to compensate for the apparent disparity in area assignments, the project team analyzed the locations of work performed by personnel during the month of June, 2001. To accomplish this, the project team identified those crew members who were assigned to the East and West Centers, and summarized their numbers of hours expended during the month of June, 2001 within each Council District. Then, the hours were summarized according to whether specific Districts were within or outside the crew members’ assigned Center area of responsibility. The results of this analysis are presented in the table below:

**Summary of East and West Center Staff Hours by Area of Responsibility
June, 2001**

Personnel Assigned to:	Hours of Work Performed in Council Districts within Assigned Center's Area of Responsibility	Hours of Work Performed in Council Districts Outside Assigned Center's Area of Responsibility	Total Hours
East Center	2,340	72	2,412
West Center	2,138	32	2,170
Total	4,478	104	4,582

Therefore, the table shows that, even when considering the number of hours expended by East Center personnel which were outside of the Center's area of responsibility, the large majority (over 97%) of hours expended by East Center personnel during the month of June were expended within Council Districts which are assigned to the East Center. Similarly, over 98% of hours expended by West Center personnel were for activities performed in Council Districts which were within the West Center's area of responsibility. The table also indicates that the East Center transferred out 40 more hours into West Center areas of responsibility than was the case for West Center personnel into the East Center's area of responsibility. If the month of June, 2001 can be assumed to be indicative of the other 11 months of the year, then there may have been about 480 more hours transferred into the West Center area of responsibility than was transferred into the East Center areas. This equates to approximately 30% of one FTE, which is far less than adequate to account for the imbalance in workloads assigned between the two Centers.

An additional indicator of work load distribution is the use of overtime. The Internal Audit staff of the Finance Department reviewed overtime records for personnel for the calendar year 2001. That review showed that total overtime paid to East Center personnel was \$63,710,

and overtime paid to West Center personnel was \$74,134. This difference in overtime is commensurate with the imbalance in workloads assigned between the Centers.

The analysis above indicates that, by any measure or standard applied, there is an imbalance in work assignment between the East and West Centers. Viewed differently, it may be argued that there is an imbalance in the staffing resources assigned to the two satellite centers. This phenomenon would be a relatively simple one to correct if this were the extent of the problem; however, as we will discuss throughout this chapter, there are also related problems in terms of work order management and structural supervisory issues. In fact, by transferring responsibility for District 13, and that portion of District 12 which is currently split, to the East Center area of responsibility, the overall distribution of workload would be approximately the same, as the table below shows:

**Effect on Workload Distribution by Transferring
Council District 13 and All of District 12 to East Center**

Scenario	East Center		West Center	
	Road Miles	AIM Work Orders	Road Miles	AIM Work Orders
Current	932	7,831	1,087	9,412
Proposed	1,014	8,516	1,004	8,727

Recommendation 2-9. As the table shows, through a simple reallocation of areas of responsibility, the Division can attain rough parity in the workload distribution between East and West Centers. This reallocation is a geographically logical one, as Districts 12 and 13 are located in the far eastern area of Davidson County. The project team does, in fact, recommend that the Division make this change, as there should be a reduction in overtime associated with the West Center labor, a reduction in travel time for these personnel, and an increase in productivity of the East Center staff. We estimate that the cost savings for the change would be, at a minimum, \$10,500 in reduced overtime in the West center staff. There is, however, a clear difference in productivity between the two Centers as well, suggesting fundamental differences in the manner in which the two Centers are managed.

The management of the activities performed within the two Centers, and those of the Division generally, are analyzed in the following sub-sections.

8. DATA ANALYSIS INDICATES PRODUCTIVITY CONCERNS IN THE DIVISION'S DITCH MAINTENANCE FUNCTION.

As ditch maintenance is among the most frequently performed tasks by crews at the two satellite centers, the project team analyzed the methods of accomplishing this task in terms of crew sizes, route planning and degree of proactive scheduling of effort. The findings in these regards are illustrative of the general "reactive" nature of work performance at the Centers. The following discussion and analysis are provided as substantiation of these initial observations.

AIM's work orders indicate that there were a total of 1,562 requests for ditch maintenance in 2001. This ranks it as the fourth most-requested category of maintenance, and represented over 9% of all work requests for that year. Further, it represented the second greatest expenditure of effort at each of the two satellite centers in June, 2001. (Interestingly, however, the top-ranking work volumes varied significantly between the East and West Centers in June, 2001 – one of the project team's two sample months - with Mowing representing the greatest level of effort in the East, and Tree Removal the highest-volume activity in the West).

In analyzing the method of work accomplishment for ditch maintenance, the project team analyzed the month of June, 2001 at the East Center, and listed the numbers of days ditch maintenance was performed, the crew sizes, the numbers of hours expended by crew size, the numbers of sites at which work was performed, and finally, the number of Council Districts within which the daily work was performed. This latter piece of data was not utilized to determine the volume of work performed within a particular Council District, but rather to provide an indirect indication as to the degree to which ditch maintenance work is effectively

routed. For example, a specific crew may perform work at three work sites during a particular day. However, it is an indirect indication of good route scheduling if all three sites are within the same Council District. Conversely, it is indirectly indicative of either poor scheduling or a reactive mode of work accomplishment if the work was performed in three separate Council Districts. The following table summarizes the results of the analysis of the month of June, 2001 at the East Center.

**Summary of Ditch Maintenance Work Accomplished at East Center
June, 2001**

Crew Size	No. of Days	Total Hours Expended	Avg. Hours per Crew Member (per day)	Number of Sites	Number of Council Districts
2	4	33	4.1	3 days, 1 site 1 day, 4 sites	1 District 3 Districts
3	12	69	1.9	7 days, 1 site 1 day, 2 sites 1 day, 3 sites 2 days, 4 sites 1 day, 4 sites	1 District 1 District 2 Districts 3 Districts 4 Districts
4	2	60	7.5	1 day, 1 site 1 day, 2 sites	1 District 2 Districts
5	13	482.5	7.4	3 days, 1 site 1 day, 2 sites 1 day, 2 sites 1 day, 3 sites 4 days, 3 sites 2 days, 4 sites 1 day, 5 sites	1 District 1 District 2 Districts 1 District 3 Districts 3 Districts 3 Districts
6	2	78	6.5	2 days, 1 site	1 District
7	3	147	7.0	1 day, 1 site 2 days, 2 sites	1 District 2 Districts
8	2	104	6.5	2 days, 2 sites	2 Districts
9	1	27	3.0	1 day, 2 sites	2 Districts

Highlights from the table above include the following points:

- The East Center performed ditch maintenance on 17 days in June, 2001. (Note that the total number of days in the table sum to more than 17, as multiple crew sizes were used on several of the same days in the month).
- There were 9 crew-days on which ditch maintenance was performed at 2 sites. On 7 of these crew-days, the work was performed in two separate Council Districts.
- There were 6 crew-days on which work was performed at 3 sites. On 4 of these crew-days, the work was accomplished in multiple Districts.
- There were 6 crew-days on which work was performed at 4 different work sites. On each of these 6 crew-days, the work was accomplished in multiple Districts, the minimum being 3 separate Districts.
- There was a single crew-day on which work was accomplished at 5 separate work sites. On this day, the work was performed within 3 separate Council Districts.

- There were 17 crew-days on which work was performed at a single site. On these occasions, it is possible to work in only one District.
- In summary, of the 22 crew-days on which work was performed at multiple sites, there were 18 crew-days on which the work was performed within multiple Council Districts.

The above points make it clear that work is being performed in a “scatter-shot” approach, which is symptomatic of simply “putting out fires” as they occur. (It should be noted that since the project team did not have access to the exact locations of the ditches which were cleaned in each of the Council Districts, the possibility exists that work was accomplished within confined geographical boundaries, even as the work effort spanned up to three Council Districts by a single crew. The project team believes this is extremely unlikely given the degree to which crew activities covered multiple Districts. In other words, the likelihood is believed to be very low that on 18 of the 22 crew-days on which work spanned multiple Districts, the work happened to be at the very narrow intersections on the boundaries of these Districts. Further, on 11 of the 18 days in which work was performed in multiple Districts, there was at least one District which was not contiguous with the others within which work was accomplished. In one case, work was performed by a single crew in Districts 1 and 12, which are on opposite sides of the County).

However, beyond the simple reactive nature of the response, there is an equally clear failure to analyze and define the optimum crew size for the accomplishment of this task. As evidence of this observation, note that the table indicates that for the month of June alone, the East Center utilized eight different crew sizes to accomplish its ditch maintenance workload. It is not possible for the project team to determine the optimum crew size for this type of work in Metro, as the numbers of linear feet of ditch cleaned each month are not reported for specific crew sizes.

Recently, another jurisdiction conducted an analysis of the impact of crew size on ditch cleaning productivity. Although that jurisdiction's crew sizes did not vary as greatly as those in Metro, the analysis pointed out some useful results that are directly relevant to Nashville. These can be summarized in the table below.

Summary of Recent Ditch Cleaning Effectiveness by Size of Crew

Crew Size	Feet Cleaned	Hours Expended by Total Crew	Hours Expended per Worker	Feet Cleaned per Person-Hour Expended
3	4,265	124.5	41.5	102.78
4	12,121	497.0	124.3	97.55
5	24,615	878.5	175.7	140.10
6	19,416	744.5	124.1	156.45
7	16,320	663.5	94.8	172.15
8	830	66.0	8.25	100.61

Note that the bolded line, corresponding to the crew size of 7, reflects the maximum number of linear feet of ditch cleaned, by crew worker, for each of six different crew sizes. Industry practice indicates that ditch cleaning, like many other functions performed in public works operations, displays varying levels of productivity per worker based on the crew sizes utilized. In the case shown above, there is strong evidence to suggest that, for this particular community, seven crew members is optimal for its ditch cleaning function. This will vary according to the length, width, accessibility and relative cleanliness in Metro; however, the methodology used in determining this optimum crew size should be used for this, and other functions.

The project team attempted to determine the optimum crew size for the Streets and Roads Division's ditch cleaning crews, however the data on feet cleaned were so clearly incorrect that this exercise did not prove valuable. The primary point of this discussion is not to focus strictly upon the ditch maintenance effort, but rather on the importance of establishing work standards,

and to measure results and hold crews accountable for their accomplishment. The project team again stresses the importance of measuring work performed and developing work standards and expected levels of productivity in this, and other, functions and activities performed within the Division. For ditch maintenance, the project team suggests that the Division establish a targeted service level of 140 linear feet of ditch cleaned per person-hour.

Recommendation 2-10. The Division should begin the process of determining optimum crew sizes for each of the functions performed at the Centers, as well as at the satellite locations, based on a standard of 140 linear feet of ditch cleaned per person hour (commensurate with a crew size of five). The implementation of this recommendation will require the Division to allocate time and effort to more than a surface level of analysis. Specifically, although an automated work management system will generate cost data and productivity of labor for certain tasks, it will require a higher level of analysis to perform comparative analyses for various crew sizes to determine the optimum sizes for each tasks. It should be noted that the ditch maintenance functions has recently been slated to transfer out of Public Works. The project team provides a methodology for the analysis suggested in the report for ditch maintenance crews, which would continue to be valid regardless of which department is responsible for the function. This methodology should be extended to other functions in the Division as well. There is no cost associated with this recommendation; we would expect that the benefit of this recommendation would be a greatly enhanced level of productivity both in ditch cleaning and other crew based work such as street maintenance and repair, signs and signals, tree crews, and the like, resulting in greater cost efficiency.

9. THE STREETS AND ROADS DIVISION SHOULD ESTABLISH AN ANNUAL WORK PLAN TO GUIDE THE ACCOMPLISHMENT OF WORK, AND TO ENSURE ACCOUNTABILITY FOR ITS USE OF RESOURCES.

It is common in Public Works operations to assume that the unpredictability of work and work locations makes annual planning infeasible or, at best, a widely varying target. While the basic “unpredictability” assumption is true, it does not negate the value of planning efforts related to historically probable events. The project team has noted the fact that activities are being accomplished in the field, and are being accomplished, in most verifiable cases, cost-

effectively. However, there are at least two issues regarding the accomplished work that the project team raises. These include the following:

- With the exception of contracted work, as well as milling and paving by in-house crews, the activities performed by Special Operations, East and West Centers, appear to be performed almost solely in reaction to requests for services.
- Managers have not actively sought information which would enable them to anticipate workloads, location and timing of services, and staffing needs for the various crews under their supervision.

Although both of the above issues present separate problems, they are related insofar as the lack of historical workload measurement data prevents the establishment of meaningful targeted service levels for the Division. In on-site interviews and data collection efforts, the project team was able to collect certain information from monthly reports which provides limited data regarding such activities as tons of asphalt patch mix used, feet of ditch cleaned, cubic yards of base repaired, square yards of street surface milled, as well as other measures. A reproduced monthly report for the Special Operations Section for January, 2001, is provided in the exhibit on the following page.

Although the information contained in the monthly report is useful to some degree, it fails as a meaningful management tool on several measures. These include the following:

- **The monthly report does not provide information regarding the resources utilized to accomplish the work.** – Note that in the sample reproduction of the monthly form for January, included as an attachment to this report, 1390 square feet of concrete was replaced. In isolation from any other historical data, this piece of information does not reveal sufficient facts about the concrete replacement effort in Metro. For example, it does not reflect the numbers of person-hours expended in replacing the concrete. Nor does it tell managers the locations of concrete replaced, the types of employees used, the crew sizes, the equipment used, or whether it was initiated as part of a targeted effort to ensure all concrete is replaced on a specified time frequency, or whether it was replaced in response to complaints.

- **Information appears to be captured inconsistently between Centers.** – The full extent of this problem is unclear, however the project team noted, in summarizing annual totals of work accomplished, that at least one reported metric is captured differently between the East and West Centers. This metric is the asphalt patching “Square Yards Repaired”. It is apparent that one of the two satellite centers reports this data incorrectly, or they both report it accurately using different units of measurement. For example, the West Center repaired a total of 2,270 square yards in 2001, using 2,437 tons of asphalt patch. The East Center reported that it repaired 32,190 square yards, using 1,579 tons. The likelihood is that the East Center is reporting area in square feet (although the form indicates otherwise), however, the error has been allowed to persist.
- **The monthly reports do not relate the metrics to expected levels of productivity.** – This issue relates primarily to the lack of establishment of targeted service levels for each of the major functions performed. However, the lack of service level definition (for example, how often should rights of way be mowed?; how many curb miles should be swept by in-house crews in the Central Business District per day?, etc.) is a symptom of the lack of collection of data regarding daily, monthly and annual production by in-house crews, as well as a lack of comparison to industry standards for such activities as square yards of pavement repaired per day per crew, linear feet of ditch cleaned per day per crew, etc. Therefore, much of the data reported in the monthly reports is of limited value, given that the data are not placed within the context of what was expected, or *planned*.

Roads Division Monthly Report			
Center- Special Operations	Month - January		Year - 2001
	A.I.M.	Long	Total
Prior month balance	<u>361</u>	<u>70</u>	<u>431</u>
Work Orders completed	<u>316</u>	<u>1</u>	<u>317</u>
New work orders received	<u>155</u>	<u>1</u>	<u>156</u>
Balance	<u>200</u>	<u>70</u>	<u>270</u>
Work orders over 30 days	<u>139</u>	<u>48</u>	<u>187</u>
Patching		Sidewalks	
_____ Tons Mix Used		_____ 460 Sq. Feet Repaired	
_____ Sq. Yards Repaired		_____ 1390 Sq. Feet Replaced	
_____ Feet Berm		_____ Sq. Feet New	
		_____ 1 # D/W Ramps	
		_____ 2 # Pedestrian Ramps	
Drainage		Concrete Curb	
_____ Feet Ditch Cleaned		_____ Feet Repaired	
_____ 70 # Inlets Cleaned		_____ 235 Feet Replaced	
_____ Feet Pipe Cleaned		_____ Feet New	
_____ 40 Feet Pipe Installed			
_____ Headwalls Installed			
_____ Headwalls Built			
Litter Cleanup		Fence	
_____ 2418 # Receptacles Serviced		_____ Feet Repaired	
_____ 60861 Feet Alleys Cleaned		_____ Feet New	
_____ 223.2 Tons Debris Dumped			
_____ 296.66 Feet Alleys Cleaned by Contractor			
Base Failures		Guardrail	
_____ Cubic Yards Excavated		_____ Feet New	
_____ Square Yards Repaired		_____ Feet Repaired	
Emergency Calls		Signs	
_____ Tree Calls		_____ 248 # Manufactured	
_____ Debris in road		_____ 268 # Replaced	
_____ 8 HazMat		_____ 63 # New	
_____ 23 Signs			
_____ 149 Signals			
_____ Snow Removal			
	_____ 13.5 Tons salt used		
	_____ 88.1 Miles salted		
	_____ 28 Miles plowed		
	_____ # Calls		
		Street Lights	
		_____ 11 # Requested	
		_____ 50 # Installed	
		_____ 82 # Removed	
		_____ # Relamped	
		Street Sweeping	
		_____ 838 Miles swept Metro	
		_____ 37 Miles swept contract	

<p>_____ Other</p> <p>Milling</p> <p>_____ # Work Orders Completed</p> <p>_____ Square Yards</p> <p>Paving</p> <p>_____ 1 # Work Orders Completed</p> <p>_____ Square Yards</p> <p>_____ 16 Tons of Asphalt</p> <p>Markings</p> <p>_____ 4 # Legends</p> <p>_____ 155860.32 Feet Thermoplastic</p> <p>_____ 19641.6 Feet Paint</p> <p>_____ 991 Crosswalks</p> <p>_____ 1497 Stop Bars</p> <p>Shoulders</p> <p>_____ Feet Constructed</p> <p>Median</p> <p>Mowing/Trimmed</p> <p>_____ Sq. Yards</p>	<p>_____ Miles flushed</p> <p>Chipper Service</p> <p>_____ 1190 # Crew hours (Contractors)</p> <p>_____ 585.86 Tons</p> <p>Vacant Lots</p> <p>_____ 15 Previous balance</p> <p>_____ 33 New W.O.</p> <p>_____ 20 # Completed</p> <p>_____ 12 Balance</p> <p>Graffiti Removal</p> <p>_____ 3 # Request</p> <p>_____ 3 # Completed within 48 hours</p> <p>_____ Sq. feet removed</p> <p>Base Stone</p> <p>_____ Tons</p> <p>R/W Trimmed</p> <p>_____ Miles</p> <p>R/W Mowing</p> <p>_____ Miles</p>
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Related to the last point above, the project team was able to obtain from the Information Services Department of Metro a summary of Automated Inquiry Management (AIM) work orders. Prior to the project team's request, the information contained in the database had not been summarized or analyzed by managers in the Department, but rather the information regarding complaints by Council District, by type of complaint, was input into the AIM system, but not retrieved, other than to report the number of open work orders at the end of the month. It is important to note that a potentially valuable piece of data is available to management in forecasting workloads, yet its value has not yet been fully recognized. The data contained in the AIM summary will be utilized at a later point in the report. The intent of this section, however, is to point out the need for a greater level of focus upon the types of information available and required to create an annual plan of work to be accomplished by the Division.

The exhibit on the following pages provides a guideline for establishing the Division's annual work plan. Note that there are a series of steps in the development of this plan which will require an intensive analysis of activity levels which have been provided on a historical basis. This analysis has not been performed before, and will require Streets and Roads Division personnel to pull activity reports from prior years to establish a "baseline" of effort by task, as opposed to the current method of work accumulation, which relies upon the use of CostSum. Although CostSum may in the future provide certain useful data, it has limitations (as will be discussed below), and the Division should take a more proactive stance in utilizing its available historical data.

Recommendation 2-11. The project team recommends the development of an annual work plan which will not only guide the Division in prioritizing and performing specific tasks, but will provide Department and Metro management with a document with

which to hold the Division accountable for results. This plan should be prepared in coordination with the Engineering Division and signed off by the Engineering Division. This will ensure a comprehensive approach to the management of streets and roads and coordination of maintenance and improvement projects. The Division will benefit from a greater level of accuracy in reporting for cost comparison purposes, which will enable cost savings through procurement of services which are more efficiently provided by contractors. Further, there will be a greater level of accountability for activities, both projected and achieved, which will allow Department management to assess the effectiveness and productivity of staff. The costs associated with the implementation of this recommendation will require a greater level of effort from managerial staff in the planning of effort, and the development of feasible targeted service levels associated with the available physical resources, as shown in the exhibits on the following pages.

It is important to note that the establishment of an annual plan involves a great deal more than simply documenting productivity and calculating what is possible based on the available resources. This annual plan should be seen as a process whereby the concerns of managers of the Division, Department and Metro are incorporated. This will require a series of planned meetings and consultations with various stakeholders and interest groups to best match the Division's resources to those required by the community.

It is important to note that the responsibilities outlined in the exhibit will fundamentally change the focus of Center Supervisors (or, as is recommended later in this report, the Special Operations Section Superintendent, after a reorganization of the Division) from their current roles of field oversight and allocation of tasks to crews, to that of management of personnel, equipment and financial resources through analysis of reports, communication with field supervisors and Division management, as well as cost and workload analysis, in order to ensure conformance with individual plans.

EXHIBIT:

**MANAGEMENT REQUIREMENTS FOR THE STEPS IN
THE DEVELOPMENT OF AN ANNUAL WORK PLAN**

Component in the Development of the Annual Plan	Requirement	Responsibility
1. Identification of Information Sources and Needs	<ul style="list-style-type: none">• The Division should analyze the sources of information available in its determination of feasible service level targets. These include, currently, CostSum and AIM, although the daily activity sheets generated by each crew contain valuable data which are not currently summarized.• Work orders should be re-examined and re-designed to ensure the consistent, and comprehensive, capture of activity data between the component Units within the Division.	<ul style="list-style-type: none">• Although this step should be initiated by the Asst. Director, it should involve, initially, the Supervisors of the three Centers, and the Traffic Control Manager. The Department Director should be consulted in the process as well, to ensure that information is coordinated among each of the Divisions.• Information Technology Department should be involved in the process, as new software systems may need to be evaluated, as recommended in this chapter.

Component in the Development of the Annual Plan	Requirement	Responsibility
<p>2. Analysis of Historical Trends in Services Provided</p>	<ul style="list-style-type: none"> • The Division should determine the levels of service which have been provided in previous years in order to proceed to the next step in the process, which is the determination of appropriate “targeted” service levels commensurate with the resources available. As a starting point in this effort, the Division should utilize benchmark targets for those services for which these exist. These can include the work standards presented in this report and the best practices analysis included as an Attachment. • This analysis should result in a historical listing of inputs as well as outputs for each service or activity. Examples include numbers of person-hours expended in, dates and locations of, milling, ditch cleaning, tree removal, vacant lot clean-up, as well as others. • This analysis will require a thorough review of previous months’ activity reports in order to extract person-hour data by activity. These data are not currently captured in CostSum. Further, as the report notes, the Division should contact the Information Technology Department to summarize previous years’ AIM work order data to establish a basis for making projections of probable work by type, by location. 	<ul style="list-style-type: none"> • Although the mechanical analysis may be delegated to Divisional staff, the effort should be initiated by the Asst. Director in consultation with the Center Supervisors. As previously noted, the Information Technology Department may provide a critical piece of the data for this effort.

Component in the Development of the Annual Plan	Requirement	Responsibility
3. Service Level Needs Analysis	<ul style="list-style-type: none"> • After the development and presentation of the “raw data” regarding historical trends, these trend data should be matched against available resources to determine the feasible targeted service levels for each activity. Input factors such as optimal crew sizes, required work, probable numbers and locations of citizen requests based on population growth, equipment availability, and others will be utilized in this determination. • The result of this step will be a definition of feasible targeted service levels for each activity type, as well as a priority listing of activities which are most critical for the Division to accomplish. This definition represents the foundation for future analyses which will focus upon the acceptability of the defined service levels, and the resulting refinement of resources needed, or alternatively, the need to reallocate existing resources to higher-priority activities. 	<ul style="list-style-type: none"> • Center Supervisors, Traffic Control Manager. • Asst. Director should provide input into the process to ensure that priorities for work accomplishment are in accordance with Departmental expectations.
4. Identification of Personnel and Equipment Resources Needed to Accomplish Targeted Service Levels	<ul style="list-style-type: none"> • This step will be the natural result of the preceding step. The Division may, after analyzing historical trends and available staff and equipment resources, find that there is a “mismatch” between feasible and desired service levels. Refinements will be made, and will lead to the next step, which is the development of budgetary needs commensurate with the targeted service levels. 	<ul style="list-style-type: none"> • Center Supervisors, Traffic Control Manager.

Component in the Development of the Annual Plan	Requirement	Responsibility
<p>5. Development of Program Budgets</p>	<ul style="list-style-type: none"> • This step represents the relatively mechanical process of developing programmatic budgets for each of the activities provided by the Division. It is important to note that this step should entail a routine examination of the feasibility of outsourcing specific functions, either due to the relative cost of in-house performance, or to the inability to accomplish certain tasks, defined in the work plan, with existing resources. • The development of the Divisional budget, therefore, is the result of an analysis of the individual components of the Division’s defined tasks and service levels, as opposed to the projected escalation of expenses for the Division as a whole, based on the previous years’ expenditures. 	<ul style="list-style-type: none"> • Center Supervisors and the Traffic Control Manager will be responsible for the determination of budgetary requirements for each of their assigned areas of responsibility. • The Asst. Director should be responsible for guiding the process, and for assembling and presenting the final budget package to the Department Director. The Asst. Director will also be responsible for making decisions regarding budgetary reductions, additions or reallocations between service centers prior to the development of the final package.

Component in the Development of the Annual Plan	Requirement	Responsibility
6. Activity Monitoring and Reporting	<ul style="list-style-type: none"> • The objective is to monitor and evaluate work performance against two standards. First, work should be evaluated against past performance to assure continued progress. Second, work should be evaluated against a final goal, which is achievement of, or exceeding, the industry standards from steps two and three. • Once targeted service levels have been defined, relying upon industry benchmarks as appropriate, with budgets established for each activity, each Center Supervisor should receive weekly and monthly reports regarding work accomplished, work planned, and any resulting variations from the plan. • Variances from the plan must be documented, with a narrative explaining the impact on the Center's ability to accomplish the overall performance targets. • Corrective actions must be defined. These may take the form of budget transfers, deferral of planned work, or outsourcing of planned activities. 	<ul style="list-style-type: none"> • Center Supervisors should be responsible for monitoring of budgets and work accomplishment according to plan, for each of their assigned areas. • Monthly meetings with the Asst. Director should be planned. These meetings should focus on variances from plans, and the corrective actions necessary.
7. Management of Resources	<ul style="list-style-type: none"> • The reporting of time, activities and expenditures should not be a strictly reactive function. Refinements must be made to the allocation of resources as it becomes clear that problems have surfaced. Examples of problems which may legitimately cause deviations from original plans may include weather related problems, unforeseen employee absences or turnover, or cost/labor issues with contractors. 	<ul style="list-style-type: none"> • Center Supervisors should monitor these issues daily and make refinements.

As the exhibit indicates, the Division of Streets and Roads should establish targeted service levels for each of the activities and services it provides. Further, it should, once these targeted service levels are established, with personnel and equipment resources defined and

procured, report on the planned and accomplished work on a monthly and annual basis. To assist in guiding the process of developing standards and work practices, the project team provides sample documents in the exhibits following this page. Immediately following these two exhibits, the project team provides sample reporting documents which list, for sample activities, a reporting format which outlines planned work and work accomplished on an annual basis.

The project team believes that the lack of the establishment of reasonable targeted service levels, as well as the planning and reporting of work in accordance with these service levels, is a primary recommendation for the Department in its transition to the provision of exemplary services. In the absence of the implementation of this business-oriented approach, the project team believes that only marginal gains are possible.

**EXHIBIT:
 SAMPLE PERFORMANCE STANDARD FOR THE SPECIAL OPERATIONS UNIT
 DRAINAGE SECTION**

Activity No.: D-001	Activity Name: Cleaning Culverts and Pipes
Description and Purpose: Periodic inspection, cleaning and removal of debris as required from culverts and pipes, as well as adjacent ditches to ensure proper drainage. This includes, but is not limited to, driveways and entrance culverts.	
Schedule All culverts and pipes should be inspected and cleaned (if required) once annually. Typically, this will occur over the spring and fall, however, emergencies may occur throughout the year and should be corrected as emergency dictates, or as other routine, scheduled work allows.	
Authorized by: Section Supervisor	Level of Service: Ensure the free flow of water through pipes and culverts through the routine inspection and cleaning at least once annually.
Crew Sizes: 1 Equipment Operator II 1 M&R Worker II Equipment: 1 Dump truck 1 Backhoe	Work Method: 1. Place safety signs and devices at work site in accordance with MUTCD standards. 2. Remove debris and any other foreign substance which impeded the flow of water from inlet and outlet channels, restoring original grade. 3. Clean out silted materials from pipe. 4. Check for damage to structure. 5. Report damage and/or need for other scheduled maintenance and repair to Superintendent.
Material: Sod Ready mix concrete Sections of concrete pipe Other, as required	Average Daily Production 2 – 6 per day

**EXHIBIT:
SAMPLE PERFORMANCE REPORT**

**Work Progress Report for Special Operations – Drainage Section
Period: July 1, 2002 – June 30, 2003**

Work Activity	Labor Days		Amount of Work		Total Cost		Productivity	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Pipe and Culvert Cleaning	220	221	2,200 linear feet	2,323 linear feet	\$43,000	\$48,512	14 to 18 per day	18.6 per day
Ditch cleaning	65	67	32,500 linear feet	30,444 linear feet	\$39,000	\$40,657	500 linear feet per day	454 linear feet per day
Installation of driveway pipe	150	150	21,600 linear feet of pipe	21,830 linear feet of pipe	\$108,000	\$101,788	One 18' segment per 45 minutes (excludes travel)	One 18' segment per 44 minutes

**EXHIBIT:
SAMPLE PERFORMANCE STANDARD FOR THE SPECIAL OPERATIONS UNIT
PATCHING SECTION**

Activity No.: P-001	Activity Name: Pothole Patching
Description and Purpose: Patching intermittent areas of roadway surface with hot or cold premix bituminous material and hand tools to correct depressions, edge failures or other potential surface hazards.	
Schedule Potholes should be repaired upon discovery throughout the course of the year. Unless the pothole presents an immediate hazard to the motorist, potholes should be patched only after allowing the surface to dry.	
Authorized by: Special Operations Asst. Superintendent	Level of Service: Fill depressions as noted, and in accordance with regular, routine spot checks of all roadway surfaces, both through the pavement condition analysis and through site observations by crews, other Metro employees, and citizen call-ins.
Crew Sizes: 1 Equipment Operator II (Patcher) 1 Equipment Operator II (Roller) 2 M&R Worker I (Hand tools) 2 M&R Worker I (Flagging)	Work Method: 1. Place safety signs and devices at work site in accordance with MUTCD standards. 2. Ensure that roadway surface is dry and potholes do not contain water or other moisture. 3. Clean out pothole using hand tools. 4. Apply tack coat of asphalt material. 5. Shovel material into potholes, not to exceed 3 inch depth. Tamp each layer prior to placing next layer. 6. Ensure that final layer is flush with pavement after compaction with hand tools or roller.
Equipment: Patch Truck Roller Pickup truck	
Material: Premix bituminous material Liquid asphalt	Average Daily Production 12 – 14 patches per day (varies by distance covered) per crew. 8 – 12 tons of asphalt per day, per crew.

EXHIBIT:
SAMPLE PERFORMANCE REPORT

Work Progress Report for Special Operations - Paving Function
Period: July 1, 2002 – June 30, 2003

Work Activity	Labor Days		Amount of Work		Total Cost		Productivity	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Resurfacing	135	131	67,500 tons	66,484 tons	\$2.06 M	\$2.04 M	500 tons per day	507.5 tons per day
Pothole Patching	185	177	2,220 patches	1,770 patches	\$96,000	\$94,585	9 tons per day	8.3 tons per day

10. THE COSTSUM INFORMATION SYSTEM IS FAILING TO PROVIDE USEFUL INFORMATION TO DEPARTMENT MANAGERS.

The Streets and Roads Division of Public Works utilizes the “CostSum” information system to report costs related to each work order. This system has numerous deficiencies in its ability to provide meaningful information to managers in their allocation of resources and planning of work. These include the following.

- **The system reports cost information rather than labor hours.** – After daily time sheets are turned in, Office Managers at each of the three locations convert the hours worked by each of the crew members into a direct cost, based upon the hourly rates pertinent to the position category within which the employee worked that day. Instead of using any internal capacity which CostSum may have, the calculations are being performed manually. These hourly rates are added and multiplied by the numbers of total hours worked on a specific job to derive the direct labor cost attributable to the job. In addition to the time consuming step of manually calculating the direct costs attributable to the jobs, the information which the calculation yields is of questionable value. This is because the direct cost of service provision can be reasonably expected to increase over time as labor rates increase. Therefore, any analysis of the resources needed for specific work types which is based on a historical review will show escalating values rather than labor hours, which should remain stable over time. In other words, increases over time in labor hours for a particular work type may be indicative of decreasing productivity. Increases in direct costs may be attributable simply to increases in hourly rates, and could mask underlying problems.

- **The system reports equipment costs which do not appear to be based on actual costs.** – In addition to the labor costs discussed above, Office Managers determine the equipment costs for machinery and equipment used on jobs. Each piece of equipment has an associated “rental rate” and this rate is multiplied manually by the number of hours the equipment was used on the particular job. These rental rates do not appear to be based on any analysis of actual costs related to repair and maintenance or depreciation rates, but rather have been in existence for many years without an update. Although the recently-completed Fleet Management study addressed this issue, the inclusion of equipment cost, even if accurate, on a per-job basis does not, in the opinion of the project team, provide managers with meaningful information. Rather, equipment costs should be allocated to specific *functions* (e.g., milling, paving, concrete repair, brush removal, etc.) to analyze their cost-effectiveness, as has been done in the analysis of milling operations in the next sub-section.

- **Managers Do Not Appear to Be Utilizing Information Contained in CostSum.** – Discussions with managers in the Streets and Roads Division indicate that the information contained in CostSum is of limited value to them. Further, a request by the project team to retrieve cost information by project code was not fulfilled due to the reported inability of the system to report information in this manner.

In summary, the CostSum system does not appear to be providing useful information to Streets and Roads managers. Further, the input of time sheet data into the CostSum system is time consuming for clerical and administrative personnel at the Centers, and duplicates, to a large degree, the payroll input process for these employees.

Recommendation 2-12. The project team recommends that the Division discontinue input into the CostSum program, as the output is of little value to managers. The Division should, however, begin the search for a suitable job work order system which will facilitate the accumulation of pertinent data, as well as summarize this data for use in the annual planning process outlined above. The costs for such systems vary greatly depending upon desired elements. If the Department is able to expand an existing license agreement with another Metro Department with a suitable information system, the cost could be as little as \$25,000 to \$50,000. However, if the existing systems in other departments are unsuitable for use in Public Works, the cost could be as great as \$350,000 to \$500,000 for a new system.

The new job work order system should incorporate the following elements:

- Intake of Calls for Service
- Generation of a Work Order
- Categories and Sub-categories of Work
- Location, Zone or District Notation
- Cost of Materials, Supplies and Other Consumables, including parts inventory
- Cost of Contracted Services
- Staff Hours in Productive Work and Travel Time
- Code for Planned or Emergency Work

- Work Scheduling System Capability
- Inventory of principal work components, including but not necessarily limited to, signs, signals, ditches, street segments, with linkage of work items to each work area. This should either be accomplished internally in the application itself or be linked to stand-alone databases of that information with a query capacity.
- Reporting of individual and crew productivity
- Interface with Geographical Information System
- Preventive Maintenance Alerts

In considering a work order system, Metro should consider several key points. These include:

- The Department of Public Works is not the only Metro department which requires a work order system. Given the investment required in obtaining and implementing a system, Metro should consider this as an application development project for all of Nashville government. As such, the needs of all potential users should be incorporated into a system selection evaluation.
- Metro currently has several initiatives that will impact a work order system. These include the FASTNET implementation, the acquisition of an activity based costing system, and a labor costing system. All of these applications will either generate information that would be needed for a robust work order system or would receive information from such a system. Thus, integration of the applications is essential.
- Metro is acquiring and installation a customer service system for a central customer call center. This system also has a basis work order system. Metro should evaluate whether this system is sufficient to meet the needs of Public Works and other departments.
- While there are numerous vendors of work order and tracking systems, for ease of acquisition and implementation, the obvious starting point should be the J.D. Edwards ERM packages that provide the core of FASTNET. J.D. Edwards has both a straight-forward public sector project management tool; it also has a Manufacturing module that has solid inventory and job order and management systems.

The next sub-section analyzes the adequacy of inventory controls at the Warehouse.

11. CONTROL PROCEDURES AT THE WAREHOUSE SHOULD BE ENHANCED TO ENSURE PROPER ACCOUNTABILITY FOR INVENTORY.

The project team conducted a physical inventory count of 162 randomly-selected items in the warehouse. Conducted on January 7, 2002, this physical count was performed to ensure that adequate controls existed over the items contained in the warehouse. The 162 items selected represented a value of \$56,075.37, or 7.7% of the total value of \$728,089.42 in inventory on the date of the sample. It should be noted, further, that the total value of items purchased for placement in the Warehouse inventory for the 12 months ending in January, 2002, was \$143,054.

The Warehouse includes all non-rolling-stock items for which Public Works crews have operational needs. Examples of these items include wrenches, hacksaws, gloves, caulk, degreasers, electrical cords and many other items. The procedure for checking out items from the Warehouse entails creating a paper ticket denoting the name of the requestor, the item description, item count and date of disbursal. As items are checked out, the counts in inventory are “debited” in the inventory program (an internally-developed system utilizing Qbasic, a DOS-based program), and reconciled against physical counts which are performed annually for the entire stock. In addition to the annual count, the three employees at the Warehouse perform cycle counts once every two weeks on a percentage of the inventory. The results of these routine inventory exercises are presented to the Public Works Department’s Business Manager.

A summary of the results of the physical inventory sample performed by the project team is presented in the table below:

Summary of Physical Inventory Sample

Performed January 7, 2002

Range of Discrepancy between Physical Count and Warehouse Record Count	Number
No Discrepancy	104
Count Short by 1 to 2 Items	25
Count Short by 3 to 5 Items	10
Count Short by 6 or More Items	5
Count Over by 1 to 2 Items	13
Count Over by 3 to 5 Items	3
Count Over by 6 or More Items	2
Total Number of Items Sampled	162

As is shown in the table, the project team found no discrepancy between the physical counts and the item counts in the warehouse records for 104 of the 162 items sampled, or 64%. However, there were 38 categories for which the project team's physical count indicated a discrepancy of at least 2 items. This could be due in part to the fact that the inventory was being issued throughout the day while the count was being taken. This equates to 23% of the categories. The remaining 13% of item categories displayed discrepancies of greater than 2 items. This degree of inaccuracy in accountability for inventory represents a potential problem for the Division, with the 36% discrepancy rate representing a far greater level than is acceptable. Typically, in well-managed warehouses, this rate will be less than 3%, which allows for an accounting for inventory which has recently been issued but not yet entered into the inventory tracking system.

The results of the inventory sample indicate that certain procedures need to be examined. Although in most cases the discrepancies are relatively small, the numbers of categories for which discrepancies appeared are symptomatic of a potential procedural deficiency regarding the accountability for "returnable" items issued to crew members. It should be noted that, in conducting this inventory, MAXIMUS project staff received an inventory list in the morning and

conducted the actual counts during the afternoon; this would, expectedly, result in some differences in the inventory count.

In analyzing this function, interviews indicated that Warehouse personnel do not routinely check for items issued to crews on longer-term loans. This may account for part of the discrepancy in physical counts and warehouse counts. Further discussion with the Warehouse Manager indicates that the Warehouse had experienced personnel problems over the past 6 months relating to failure to follow procedures in counting inventory items. Reportedly, however, these employees have been terminated, and the Warehouse Manager is optimistic that the problems have been corrected. However, given that the Warehouse is now reportedly performing routine cycle counts of inventory items once per two week period, discrepancies on the magnitude of those documented during the project team's sample count should have been discovered and corrected to a much larger degree than has apparently been the case.

Recommendation 2-13. Based on the above analysis, the project team makes the following recommendations to improve inventory management:

- **Warehouse personnel should make weekly "spot checks" of inventory items which have been issued to Department personnel on longer-term bases. These may include such items as wrenches, shovels, gloves, etc. If items are found to be missing, these occurrences should be documented and the Division Assistant Director should be notified. Additionally, procedures should be established to penalize employees to whom the items were issued.**
- **The results of the bi-weekly cycle counts should be issued to the Department's Business Manager, as well as to the Assistant Director of the Division of Streets and Roads. Explanations for any discrepancy should accompany the bi-weekly report.**
- **Procedures should be established in the Warehouse which will decrease the rate of discrepancy from current unacceptably high levels to no more than 3% at a single point in time.**

- **The Department should also modernize its inventory software system, which is currently an older, limited capacity system. Since inventory items track primarily to the Department's streets and roads operations, it would be appropriate to incorporate the inventory management into the recommended job work order system previously discussed. The costs for this would be included in the cost of the work order system.**

While there is no cost implication to these recommendations, the project team believes that the implementation of the above recommendations will establish a degree of accountability for the inventory that is not currently present at the Warehouse.

The next issue analyzes the effectiveness of communicating utility cut information to the Technical Services Unit of the Streets and Roads Division

12. THE DIVISION SHOULD REVISE ITS POLICIES AND PROCEDURES FOR ENSURING THAT ROADWAY DAMAGES ARE REPAIRED, WITH THE TECHNICAL SERVICES UNIT OF THE DIVISION ADVISED AFTER EACH DAMAGE OCCURRENCE AND REPAIR.

The project team noted in interviews that the permitting process may result in inadequate attention to ensuring that utility cuts are performed in accordance with Metro standards. In obtaining permits for road cuts, contractors and utilities obtain permits through the Engineering Division, and are assessed a "Damage Assessment Fee", which is based on the age of the surface of the roadway segment. After this point, the contractor is responsible for ensuring that the road segment is repaired after the cut. There are at least two concerns regarding this process. These are as follows:

- The project team has discerned no formal procedure to ensure that the road cuts are performed. Further, if they are completed, there is no oversight of the process to ensure that these repairs are performed in accordance with Metro standards. Interviews do not indicate that this latter concern is an issue at the current time, however, the lack of a formal procedure is of some concern to the project team.
- After road cuts are performed and repaired, there does not appear to be a formal notification process to the Technical Services Section of the Streets and Roads Division. This lack of notification could, in theory, result in road segments which have a far lower pavement rating than are in the IMS rating system software. This

in turn could result in the incorrect identification of road segments which are most in need of resurfacing each year.

Recommendation 2-14. The project team recommends that the current policy be revised to establish the Department of Public Works as the sole agency responsible for repairing all roadway damages, regardless of origin or cause. Those individuals or agencies receiving permits for roadway cuts should, at the time of purchasing the permit, pay a fee sufficient for Public Works to repair the cut. This variable fee should be assessed based on the proposed magnitude of damage. Once the cut is repaired, Technical Service should be notified, with that Unit making the appropriate revision in the pavement management system. Although data do not exist currently to estimate the fiscal impact of the imposition of this fee, the cost to the Department will be recovered from the utilities and other contractors.

The next issue provides a preliminary analysis of the methods currently utilized to identify street and road segments for repaving.

13. THE DEPARTMENT SHOULD AMEND ITS METHOD OF IDENTIFICATION OF STREET SEGMENTS FOR REPAVING.

The Technical Services Unit of the Streets and Roads Division utilizes the IMS pavement management system for identifying those road segments which are in greatest need of repaving. This system, administered privately by IMS, ensures the physical re-evaluation of each road segment within Metro once every five years. The Technical Services Unit collects data throughout the year regarding road damage incurred through physical observations, notices of utility cuts, analyses of base failures, and other methods. The Unit runs scenarios on the probable effect of expenditures on the repaving of streets on the overall Metro street condition index, as well as on those of specific Council Districts.

It must be noted in this analysis that, during the period of the project's on-site activities, the Technical Services Unit was informed by IMS that it had noted errors in the calculations of many of the pavement condition ratings contained in the system. The project team understands that these data errors are being corrected through the combined efforts of IMS and the Technical

Services Unit. The project team considered these developments, and attempted to determine the magnitude of their effects upon the validity of the analysis of the pavement management system and the Department's use of the system in determining the identification of street segments for repaving, and believes that, although there are errors of unknown magnitude in the data, there are meaningful conclusions which can be made regarding the use of the pavement condition ratings.

For these reasons, the project team believes that a valid analysis can be made regarding the Department's use of the pavement condition ratings, even as they currently exist. This analysis is presented in the paragraphs below.

Interviews indicated that, although the pavement condition rating influences approximately 80% of the decision regarding which road segments are repaved in Metro, the other 20% is based on Council member identification of specific road segments within their respective Districts which need repaving. The project team, in attempting to determine the effectiveness of this methodology, analyzed all road segments which were paved, as well as those which were not paved during 2001. The results, summarized in the exhibit on the following page, indicate that, at least on a cursory analysis, the method is succeeding in its overall purpose, as the weighted average rating (i.e., road ratings are "weighted" according to the length of the road segment being analyzed) of the roads which were actually paved in 2001 was 60.7 prior to repaving. Conversely, those road segments which were not repaved had an overall pavement condition rating of 78.1, indicating that, generally, the road segments which are being resurfaced are in greater need than those which are not being resurfaced.

A closer analysis of individual ratings of road ratings indicates that, of the 893,409 linear feet which were paved last year, 194,087 feet had pavement condition ratings of at least "72",

which represents a relatively high condition level. It should be noted that, of these 194,087 feet, there were reasonable explanations for 99,733 feet of repaving. These explanations include repaving certain segments to ensure conformity with adjacent repaved road segments, repaving utility cuts, repairing severe base failures, and other reasons. The remaining 94,354 repaved feet with ratings equal to or over 72 represent over 10% of all repaved street mileage.

On the other hand, there were 801,851 linear feet of roadway which displayed pavement condition ratings below “60” which were *not* designated for repaving. The project team did not identify the reasons for the decisions for not paving these road segments, although it is very possible that utility companies have placed “holds” on some portion of these. This reason is not likely, however, to account for the majority of this number, which represents about 152 miles.

**SUMMARY OF STREET SEGMENTS PAVED AND NOT PAVED
BY COUNCIL DISTRICT, 2001**

District	Lengths (ft.) Paved in 2001	Weighted Avg. Rating of Streets Paved in 2001	Lengths (ft.) Not Paved in 2001	Weighted Avg. Rating of Streets Not Paved	Percent of Street Segments Paved in 2001	Street Lengths with Ratings <50 Not Paved	Percent of Streets with Ratings <50 Not Paved
1	37,484	62.3	753,384	82.3	4.20%	9,371	2.6%
2	45,739	60.9	255,210	70.7	5.12%	29,498	8.2%
3	25,154	75.4	314,361	77.9	2.82%	7,717	2.1%
4	14,055	60.6	267,350	73.8	1.57%	12,394	3.4%
5	4,294	52.1	221,974	78.6	0.48%	4,314	1.2%
6	4,990	52.3	213,937	74.7	0.56%	9,554	2.6%
7	20,028	64.8	240,624	75.3	2.24%	5,508	1.5%
8	19,510	67.1	236,981	77.4	2.18%	6,803	1.9%
9	19,064	67.5	289,731	77.8	2.13%	21,354	5.9%
10	61,282	55.2	319,204	78.0	6.86%	0	0.0%
11	43,530	60.6	297,135	81.0	4.87%	1,977	0.5%
12	23,826	76.3	329,599	79.7	2.67%	0	0.0%
13	12,469	70.1	245,818	78.5	1.40%	0	0.0%
14	5,455	67.2	237,707	82.3	0.61%	0	0.0%
15	17,327	70.4	481,707	79.5	1.94%	1,636	0.5%
16	9,493	68.2	284,921	81.0	1.06%	0	0.0%
17	7,577	66.0	206,274	84.7	0.85%	2,238	0.6%
18	17,747	62.4	127,774	79.2	1.99%	4,436	1.2%
19	23,046	72.4	284,162	78.0	2.58%	4,135	1.1%
20	0	N/A	286,862	78.1	0.00%	1,937	0.5%
21	24,346	47.3	262,442	71.9	2.73%	30,724	8.5%
22	9,848	52.5	215,259	79.8	1.10%	16,179	4.5%
23	75,076	60.0	342,922	74.8	8.40%	23,084	6.4%
24	61,976	52.3	268,611	70.2	6.94%	56,393	15.6%
25	60,794	49.5	224,631	76.2	6.80%	6,305	1.7%
26	6,839	61.8	217,088	80.7	0.77%	2,386	0.7%
27	21,365	63.9	226,578	80.5	2.39%	4,604	1.3%
28	12,224	68.9	251,968	77.7	1.37%	8,753	2.4%
29	34,596	68.6	357,018	77.6	3.87%	21,588	6.0%
30	21,084	61.2	169,790	81.0	2.36%	1,139	0.3%
31	33,977	66.3	329,793	82.5	3.80%	2,594	0.7%
32	19,324	59.8	278,902	80.1	2.16%	6,137	1.7%
33	39,826	53.4	199,759	77.1	4.46%	11,142	3.1%
34	49,943	58.5	173,336	75.6	5.59%	9,260	2.6%
<u>35</u>	<u>10,121</u>	<u>54.3</u>	<u>351,678</u>	<u>73.9</u>	<u>1.13%</u>	<u>37,722</u>	<u>10.5%</u>
Total	893,409	60.7	9,764,490	78.1	100.00%	360,882	100.0%

In further analyzing the street segments which were and were not paved in 2001, the project team noted that five of the 35 Districts (Districts 10, 23, 24, 25 and 24) received approximately 35% of all road surfaces which were paved, yet represent only 15% of the linear feet of roadways in Metro. Conversely, as the exhibit shows, the five Districts (Districts 2, 9, 21, 29 and 35) which contained approximately 39% of all of the road segments in the system with pavement condition ratings less than 50 received only about 15% of all of the road surfaces paved in 2001. (It should be noted that District 24, one of the five Districts receiving most of the paving in 2001, also contained 15.6% of road segments with pavement condition ratings less than 50 which were *not* paved).

The project team's data analysis indicates that the current method of identifying road segments for repaving needs refinement to ensure that the overall Metro road condition index is maximized. The current decision method purportedly places greatest weight on the pavement condition index; however, as has been shown above, there are numerous exceptions. On the other hand, there is reportedly some weight given to the wishes of individual Council members in identifying road segments for repaving, although as the exhibit in this sub-section shows, there are large variances in the numbers of linear feet repaved in individual Council Districts.

Recommendation 2-15. The project team recommends that, once each of the pavement condition ratings is corrected in the system, with sufficient procedures developed and implemented for the retention of backup data, the Department utilize only the pavement condition ratings as the source for identifying street segments for repaving, with the objective being to maximize the overall pavement condition rating of Metro streets. Although there are legitimate reasons for resurfacing streets segments which display pavement ratings greater than 70 on occasion, these should be minimized. It is therefore recommended that, in absence of compelling reasons to resurface segments greater than 70 (such as to ensure even quality with adjacent segments recently resurfaced, repairing utility cuts, etc.), that the Streets and Roads Division discontinue the resurfacing of streets with pavement ratings which are 115% more than the average rating of all streets recommended for resurfacing. The benefit to Metro from changing this procedure is in the

maximizing of the overall street condition, as opposed to those street segments in selected Districts. This has a further benefit in the overall convenience of motorists.

Recommendation 2-16. Nashville may wish to consider a more encompassing approach to planning its streets and other public work services by dividing the City according to maintenance districts. While there is no cost to this change, it would result in a more effective maintenance program by creating a consistent division of responsibilities, and improved work planning and tracking. The Department should also work with other Metro departments to utilize maintenance districts county-wide.

While many communities have the ability to report work activity by councilmanic district for informational purposes, the industry standard is to use districts that are aligned by public works need for the purposes of scheduling and carrying out work. These districts are based on such considerations as physical contiguity, similarity in size and characteristics, natural boundaries, normal traffic flow based on traffic collection and thoroughfares. Examples of well regarded communities that use maintenance districts are Phoenix, San Diego County, San Antonio, and Charlotte.

The advantages of such an alignment would include having a fixed set of boundaries rather than districts that change every ten years, a natural flow of work, and a greater emphasis on area needs and coordinated improvements. The project team encourages the City to give strong consideration to this option as it conducts its next rounds of street evaluations and its capital planning. It would be appropriate to consider the development of maintenance districts in coordination with other Metro departments that have similar responsibilities.

The next issue analyzes the effectiveness of the current organizational structure of the Streets and Roads Division.

14. **THE STREETS AND ROADS DIVISION SHOULD ALTER ITS CURRENT ORGANIZATIONAL STRUCTURE TO PROVIDE A GREATER DEGREE OF FLEXIBILITY AND STANDARDIZATION.**

As has been noted, the Streets and Roads Division is comprised of work centers in Traffic Control, Technical Services, Parts Warehouse, Special Operations, and the East and West Centers. Each of these Units reports to the Assistant Director for Streets and Roads, and is managed individually by a Superintendent (Special Operations), District Supervisor (East and West Centers), Manager (Traffic Control), Supervisor (Parts Warehouse), or Coordinator (Technical Services). In analyzing the work functions performed under each of these separate entities, the project team poses two separate, but related, questions. These are as follows:

- Does the Streets and Roads Division accrue operating efficiencies through the current grouping of functions?
- Are there functions, currently separate, which could be grouped under a single management structure to gain greater efficiency at less cost?

The project team poses and answers a series of questions related to these issues in the following text. These questions, along with related discussion, are listed below:

- **Functionality of the organization – are like functions grouped together?** – Although there are few opportunities for cross-utilization of personnel between the Traffic Control and Technical Services sections with those in Special Operations and the Centers, each of these separate organizations does, in fact, have as its primary focus the maintenance and repair of Metro’s streets and roads infrastructure. The case may be made that the Parts Warehouse has no direct correlation with these activities, however, it functions in a supporting role, with its primary “customer” being Special Operations and the two satellite centers. Therefore, the preliminary indication is that the functionality of the Streets and Roads Division is well-served through the current grouping of organizations.

Although the Technical Services Unit of the Division is responsible for the identification of roads for repaving, through use of the IMS Pavement Condition Rating system, it has very limited interaction with other units in the Division. Observations, as well as the experience of the project team, indicate that this function has a greater degree of contact with the Engineering Division, in that it

relies upon a high degree of communication between the two functions to ensure that roadway cuts are input into the system. As Engineering is the Division responsible for the permitting of these roadway cuts, the combination of these functions may provide benefits to the Department.

- **Is the structure designed to make daily management of the organization efficient and effective?** – Again, the differing focuses of three of the component sections (Technical Services, Traffic Control and the Parts Warehouse) indicates that it is optimal to retain these as separately-functioning organizations. It is another matter as to whether these organizations should be placed organizationally under a separate Division; however, as noted above, these functions all have as their primary underlying focus the maintenance of Metro's streets and roads infrastructure. This particular argument does not exclude the possibility that the Public Works Engineering Division should be organizationally grouped with these functions as well, however, as noted below, there are other factors that mitigate against it.

The grouping of Special Operations and the East and West Centers should be approached differently, however. In interviews, the project team inquired as to the logic behind which activities fall under the responsibility of each of these separate organizations. The most common response to this question was that those functions which are performed in all areas of Metro are performed under the supervision of Special Operations. Further, those functions, such as milling and paving, which require a substantial capital investment, are performed under Special Operations, as it is both cost-prohibitive and inefficient to perform these particular services in multiple locations. It follows, then, that the work performed at the Centers is that which is least costly to perform, with the lowest level of skill sets, and that which is performed routinely enough that travel distances are minimized.

Laying aside, for the moment, the preliminary finding that there is evidence to contradict the assertion that travel distances are minimized through accomplishing certain work activities at the two Centers (see the issues related to ditch cleaning productivity, and the potential inequity of work distribution between the Centers, above), the organizational structure itself does not appear to be conducive to efficient and effective management. The "separateness" of these three organizations does not in itself prohibit the sharing of personnel and equipment resources, but it is also true that there is little evidence that this is occurring (see the discussion, above, related to the degree of personnel transfer between East and West Centers in the month of June, 2001). Further, there is little evidence that the current fragmented structure is fostering proactive management of crew time and productivity, nor the establishment of unit service levels and planning of work to be accomplished.

- **Is the manager of the organization able to manage the number of functions under the Division?** – There are few enough functions under the supervision of the Assistant Director of Streets and Roads that this is not an issue at that level. The question, then, is whether it is feasible to combine certain functions which are currently separate. In this regard, the project team raises the issue of the possibility of combining Special Operations with the two satellite centers. The issue of organizational consolidation should be viewed separately from the question of the optimum number of satellite stations. Rather, the questions should be, “Is the Streets and Roads Division gaining any efficiencies through the two extra layers of Center management?”, and “Would a single manager be able to more effectively manage the functions currently performed under these three separate organizations?” The answer to the first question is, in the opinion of the project team, the simpler one. If it is assumed that the primary functions of management are to plan and schedule work, and to ensure accountability within the organization that the work is completed in accordance with a pre-established plan, the answer to this first question must be that the Division is not realizing a maximum return on its investment in managerial staff at these levels. The answer to the second of these questions, although more complex, would also seem to indicate that a single manager would be more effective. If it is assumed that one of the primary factors underlying the placement of the two satellite centers was that the functions performed in these outlying locations require lower skill sets than those in Special Operations, the addition of lower-complexity functions would not pose a large obstacle to organizational consolidation.

- **Have the skills of individuals been recognized in the development of the organizational structure?** – Clearly, the skills of the managers and supervisors of each of the component sections of Streets and Roads have been recognized and accommodated in the organization of functions. The project team does, however, raise the question as to whether the Streets and Roads Division is the optimal location for the development, issuance and oversight of asphalt paving contracts. Although Streets and Roads is, in the opinion of the project team, the appropriate organizational location for the determination of street segments for repaving, as well as the functional accomplishment of this effort, evaluation of technical specifications contained in bids, and the financial and contractual oversight of the performance of the work, are typically functions performed outside the purview of a Streets Division, as functional knowledge is generally greater in the Engineering Division.

The weight of the discussion, above, indicates that the Streets and Roads Division would benefit from the consolidation of East and West Centers with the Special Operations Unit of the Division. These benefits include the following:

- A greater degree of flexibility in transferring personnel among functions. Consolidation of the currently-separate units will allow a single manager of the Unit to identify those activities which are at greatest risk of falling short of attaining goals stated in the annual plan, and transfer sufficient resources to that area.
- A more consistent approach to the development of targeted service levels, and the reporting of work accomplished. As has been noted numerous times in this report, there are many examples of inconsistent reporting of work accomplished between Centers on a monthly basis. Many of these instances have been allowed to stand for apparently long periods of time. The consolidation of these Centers would ensure that a single approach is developed and reported.
- A greater degree of cross-training among employees. As a single manager has greater flexibility in personnel transfer to those areas which are experiencing shortages, the affected personnel will develop a greater level of skill in more areas, therefore increasing productivity overall.

Recommendation 2-17. The project team recommends that the Streets and Roads Division consolidate the East and West Centers with the Special Operations Unit. The Division should retain the two satellite locations; however these should be under the direction of a single manager, and utilized as staging points to minimize travel time to work sites. The consolidation of the three currently-separate units into a single organization will allow the reduction of the two M&R District Supervisors. The project team recommends the retention of two M&R Supervisors at each Center to manage and provide field supervision of the crews, to receive and disseminate work orders to the appropriate crews, and to oversee the activities of the clerical and administrative staff at those locations. The annual cost savings attributable to this reduction are approximately \$104,753.

The following table provides the calculations for the estimated cost savings:

Cost Savings Attributable to the Reduction of East and West Center Management Staff

Position	Positions Eliminated	Salary at Midpoint	Extended Salaries at Midpoint	Benefits (at 30%)	Total Direct Cost
M&R Supervisor	2	\$40,289.60	\$80,579.20	\$24,173.76	\$104,752.96
Total	2	\$40,289.60	\$80,579.20	\$24,173.76	\$104,752.96

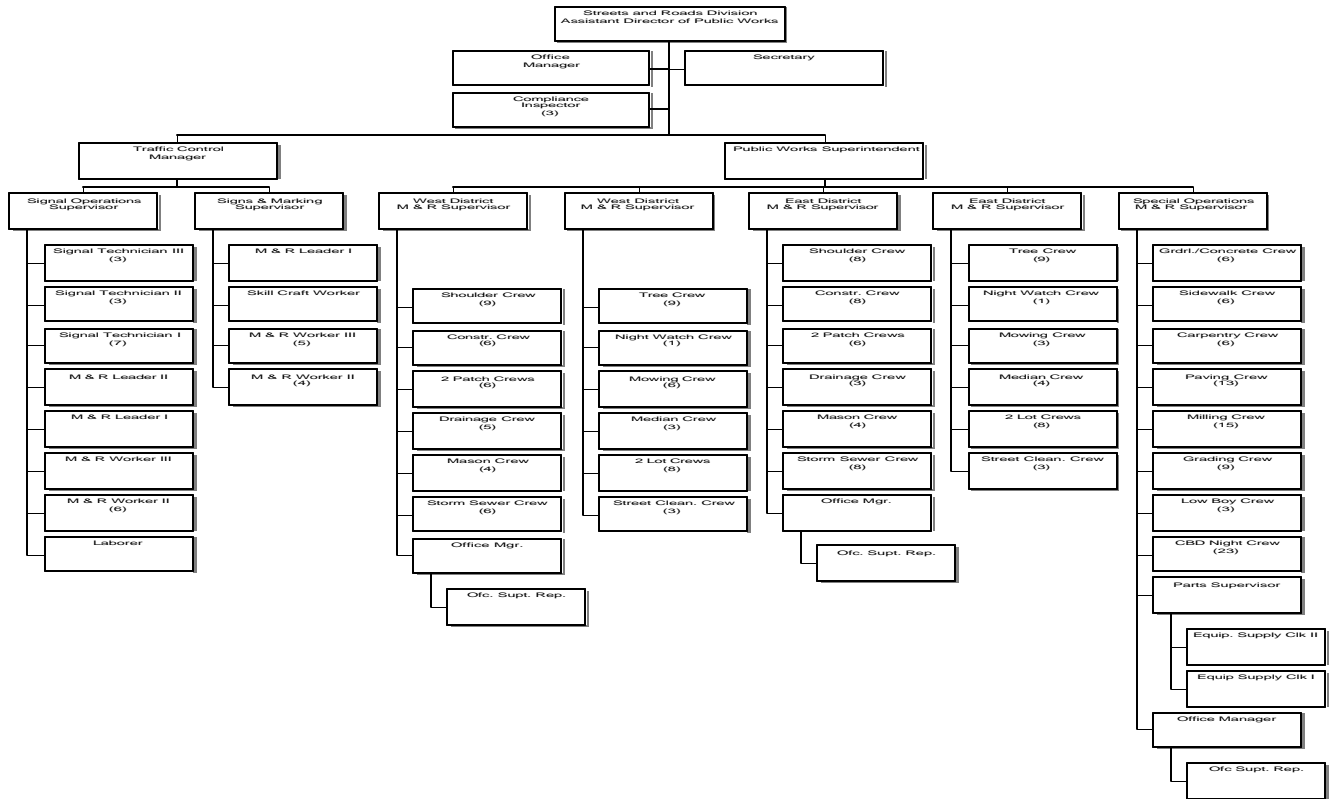
Additionally, the project team recommends that the Technical Services Unit of Streets and Roads be transferred to the Engineering Division in order to ensure adequate communication of roadway cuts through the permitting process. Further, the project team also recommends that

the Department transfer the responsibility for paving contract bids and management from Streets and Roads to the Engineering Division. This also provides greater impetus to the recommendation to transfer Technical Services to Engineering, as Technical Services maintains technical aspects of the bids currently. This recommendation is discussed in greater detail in the Engineering Chapter of this report.

The recommended organizational structure for the Streets and Roads Division of Public Works is presented on the following page:

RECOMMENDED ORGANIZATION

STREETS AND ROADS DIVISION



The next chapter provides an analysis of issues which the project team has identified in the Chipper Service Section of the Division of Waste Management.

III. CHIPPER SERVICES SECTION OF THE WASTE MANAGEMENT DIVISION

Although the Waste Management Division of Public Works provides a wide variety of services, because of the recently issued waste management plan the project team's scope of services was restricted to an analysis of the Chipper Service, or Brush Removal, Unit of the Division. The Chipper Service is responsible for the collection of curbside yard waste, both on an on-demand basis, as well as on a routine schedule.

The Chipper Service currently provides, through two private contractors, a residential brush removal service for citizens, using a combination of regular routes and on-demand pick-up. The City provides the equipment and has full time personnel assigned to supervise the operation. Although the Chipper Service has defined a service level of picking up brush a maximum of five times per year for each residence, this Section of the Waste Management Division of Public Works does not currently have the information system capability to ensure that this level of service is either attained, or not exceeded, for specific residences. Further, in the experience of the project team, a collection frequency of five times annually is a very high level of service, with two to three times per year being more typical.

The following issues have been identified in the Chipper Service Section of the Division of Waste Management.

1. **A CHANGE IN TYPE OF EQUIPMENT USED SHOULD RESULT IN A MORE EFFICIENT METHOD OF COLLECTION.**

The current method of collection of brush involves a two or three-person crew which follows a route within a particular zone of the County, and loads brush into a chipper which feeds chipped material into boxes mounted on trucks. Typically, these crews are able to complete two such 3.7 ton loads per day. After completing a load, the chipped material is taken to a

compost dump site at Bordeaux. Depending upon the location of the zone, transporting the chipped material can take up to 30 to 45 minutes one-way.

The Waste Management Division Manager has recently made a decision to alter the manner in which brush is collected. This change will entail purchasing a series of mobile “grapple arms” which will be capable of collecting curbside debris, then loading the debris into 30 yard boxes loaded onto dump trucks. Once a dump truck is fully loaded, it will transport the debris to the Bordeaux compost site and will be replaced by another dump truck, allowing uninterrupted collection of curbside brush by the grapple arm. This altered method will greatly increase productivity of the chipper crews, and result in a quantifiable cost saving to Metro, as is shown in the table below. In developing the cost savings table, the project team reviewed a six-month sample of activity as reported by the Chipper Service for a single crew utilizing the new grapple arms, or “knuckleboom” trucks, which operate in tandem with two trailers capable of hauling brush. The data reported by this single route are as follows:

- There were 2,754 “stops” made on regular routes.
- There were 524 stops made as a result of “call in” requests. Combined with the stops made on regular routes, this yields 3,278 total stops made in the 6 month period.
- There were 328 tons of debris collected on the 3,278 stops, resulting in about 0.1 tons, or 200 pounds, of brush collected per stop.
- Assuming 120 work days in the 6 months, there was an average of 27.3 stops per day. At 10 hours per day (crew members work four 10 hour days per week), this results in an average of 2.73 stops per hour.
- Observations by the project team indicate that about 1.5 hours per day are expended by crews using the current chipper truck method of collection in the transport of brush to the Bordeaux brush landfill. This results in the ability of the new knuckleboom method of collection to result in approximately 4.1 more stops per day than is possible under the current collection method.

- Given that about 200 pounds are collected per stop, crews using the knuckleboom-trailer combination can collect approximately 820 pounds per day more than is currently the case with the chipper trucks.

To complete the comparative cost calculation, the project team obtained vehicle repair and maintenance costs for the chippers and service trucks which transport them. There are no available repair and maintenance data for knucklebooms and trailers, as these are relatively new, and are under warranty, at any rate. Additionally, the project team obtained purchase costs for all equipment in the analysis, and has calculated an annual depreciation amount for each piece of equipment, based on projected economic lives of the machinery. These data, as well as the information provided in the bullet points above, are incorporated into the table below.

Comparative Costs of Alternate Brush Collection Methods

Element	Current Chipper Truck Method	Alternate Grapple Arm Method
Number of crews system-wide	20	18
Tons collected system-wide	11,480	11,480
System-wide equipment maintenance and depreciation cost	\$236,029	\$281,604
Personnel costs	\$1,302,787	\$1,172,508
Total Cost of Method	\$1,538,816	\$1,454,112

The above table indicates that the overall cost of the proposed method is about \$85,000 less expensive as a result of greater production output by crews utilizing the new method. This model is based on an assumption of the same level of collection volume with fewer crews as the basis for the cost savings estimate.

It should be noted that Waste Management Division managers report that a greater number of tons are possible to be collected per day using the new grapple arm method than is shown in the table above. This may in fact be the case. However, there are several non-static variables involved in the analysis of the two alternate service delivery methods. One such

variable, which may account for much of the difference, is the reported greater level of efficiency and productivity of contract crews as a result of more intensive management controls than have been in place in prior years. The project team does not disagree that this variable may contribute greatly to the overall greater number of tons collected, however, for purposes of presenting comparative calculations, it was assumed that greater management oversight would have contributed to higher productive levels using the old collection method by chipper trucks. At any rate, there is a finite number of tons for collection under any alternative collection scenario. The value of the calculation presented in the table is in the identification that, as the number of crews is reduced under the new method, the greater is the cost savings attributable to the service delivery method. The table makes the assumption that it is possible to make a reduction of two crews. This number was derived by equating the tonnage collected between the two methods, and determining the number of resources which would be expended under each of the two methods, considering that one method (the current chipper truck method) requires 1.5 hours per day in transportation downtime hauling brush to Bordeaux.

Recommendation 3-1. The project team recommends that the Division convert its chipper service to a fleet based on combining grappler trucks in tandem with trailers. We estimate that the annual cost savings for this change will be at least \$85,000 per year, assuming the same volume of collection.

2. THE WASTE MANAGEMENT DIVISION SHOULD ALTER ITS METHOD OF SERVICE DELIVERY FOR THE CHIPPER SERVICE.

The current procedure for brush pick-up is for citizens to call in with a request, and the Chipper Service Section informs the caller that the brush must be at the curbside, and will be collected within three weeks. If the specific residence happens to be on one of the 20 regularly-scheduled routes for collection prior to that time, the debris will be collected at that time.

Otherwise, the brush will be collected within the three-week time frame. As brush is collected, the private contractor is instructed to pick up any other brush which is in the same general area.

One issue with the current service delivery method is that, as brush is collected from residences which have called in for “on-demand” service, the chipper trucks may, and reportedly frequently do, pass by several other residences which have placed brush at their curbsides without collecting this debris also. This practice is followed to ensure that the drivers are able to collect all on-demand brush at residences, as well as to proceed to their regularly-scheduled routes.

Metro has defined a high service delivery level in its chipper operation. To continue to provide this level of service, it is imperative that the Waste Management Division provide the most efficient routing of chipper trucks possible. Clearly, there are problems associated with the current method of service delivery, in that brush piles at the curbside are reportedly passed by as trucks continue on to scheduled locations. Further, it is apparent that Metro has not established clear policies regarding the limitations of sizes and locations of brush which will be collected, as the project team noted several incidents in which extremely large brush piles were placed at curbsides, creating a large, unplanned consumption of time on the parts of crews in feeding the brush into the chipper. In fact, one brush pile along Briley Parkway extended for over one-half mile.

The project team believes that cost savings are attainable through the elimination of the call-in service, as chipper trucks currently travel first to locations which are not on the regularly scheduled daily routes. Then, as these call-in collections are completed, the chipper trucks travel to the regular route sites and begin daily service. Although the call-in locations will be serviced

in due course, the travel times associated with arriving at these locations can be eliminated, as chipper crews will proceed directly to their regularly scheduled route locations. The cost savings associated with the elimination of the call-in service are between \$116,000 and \$232,000 annually, as the table below indicates.

**Cost Savings Attributable to the Elimination of the
Call-In Brush Collection Service**

Element	Number
Number of call-in collections made from 8/1/01 to 1/23/02 (20 routes)	7,366
Number of days on which brush collection occurred from 8/1/01 to 1/23/02	119
Average number of call-in collections made per route (8/1/01 through 1/23/02)	368.3
Average number of call-in collections made per crew per day (8/1/01 through 1/23/02)	3.1
Average cost per ton collected by private contractors (Avg. of Jan. and Feb., 2001 – from internal records)	\$638.78
Average number of tons collected per stop (see previous sub-section)	0.1 (or 200 lbs.)
Average cost per stop	\$63.88
Average number of stops per hour (see previous subsection)	2.73
Average collection cost per hour (\$63.88 * 2.73 stops per hour)	\$174.39
Number of routes system-wide	20
Total hourly cost of collection by private contractor (hourly cost * 20 (routes))	\$3,487.80
Number of collection days per year	200
Annual cost savings assuming 20 minutes of travel time daily to and from call-in collections	\$232,520
Annual cost savings assuming 10 minutes of travel time daily to and from call-in collections	\$116,260

Recommendation 3-2. The project team recommends that the Division alter its service delivery method to provide its chipper service strictly on a scheduled-route basis in order to facilitate the collection of curbside debris. The cost savings from this recommendation should be between \$116,000 and \$232,000 annually, as is shown above. Further, we believe that this recommendation will enable crews to be more effective in their work schedules and will reduce the number of public complaints about being “missed” by chipper crews.

It is commendable that the Waste Management Division has defined a high service level for its citizens by attempting to accommodate call-ins on a 30-day turnaround basis; however, this is resulting in unforeseen problems, not only in the passing of piles of brush on the way to brush which has been called in (resulting in citizen complaints that the service was originally

designed to avoid), but also in the interruptions of routes. Although call-ins are collected at the beginning of the day, prior to the commencement of regular routes, it is disruptive to crews who must “back-track” to sites in order to pick up at the point at which the regular route was stopped on the previous day.

Recommendation 3-3. Metro should establish regulations on the preparation of brush for pick-up and rigidly adhere to those standards. This will have no cost requirement, but will result in greater work productivity.

At present, Metro’s standards call only for brush being less than four inches in diameter and precludes commercially cut brush. Commercial firms are required to dispose of any brush they generate, but the project team’s observations of the chipper service lead us to believe that this is not uniformly the case. Most typically, communities require that the brush be trimmed, cut to maximum lengths, and bundled. Experiences of these jurisdictions indicate that such requirements simplify the collection process, enable a greater volume to be collected more quickly, and reduce the incentive for commercial firms to leave brush for City pickup; in this later instance, the Briley Parkway situation described earlier is a particular case in point. Typical standards include:

- Brush must be trimmed.
- All items should be cut to a maximum length of four to five feet, with three inch diameter maximum
- The items should be bundled with biodegradable rope or twine.

Implementation of these new standards will require considerable community education and the willingness of Metro to accept complaints and public criticism for not collecting brush that fails to meet these standards.

IV. ENGINEERING DIVISION

This chapter presents an analysis of the Engineering Division. It includes an analysis of the following:

- Contract management
- The organizational structure of the division
- Processes utilized to manage the capital improvement program
- Staffing
- The sidewalk program
- The proposed traffic operations center.
- Parking operations.

We have included parking operations within this chapter based on a previous Metro plan to combine supervision of parking operations and transportation engineering under a single individual, a plan which we recommend in this chapter.

The next two sections of this chapter address specific issues relating to contract management, followed by discussions of other points relevant to the Engineering Division. The project team conducted separate evaluations of the two elements of contract management, project management and financial controls, since that is generally how the Department has segmented duties. However, our findings in each case overlap, providing support to our recommendation for improved coordination of project management.

In the next section, we review financial management specifically. In the section following that, we look at the project management element and develop a series of recommendations that treat contract management as a totality.

1. PROJECT TEAM REVIEW OF FINANCIAL MANAGEMENT OF DEPARTMENTAL CONTRACTS INDICATES SEVERAL PROBLEMS BOTH WITH DOCUMENT MANAGEMENT AND PROJECT MANAGEMENT.

As part of the review of the Department, project staff randomly selected sixteen contracts for review. The purpose of the review was to assure completeness and accuracy of information, verification of work requirements, and to gain a detailed understanding of the contract administration process. The contracts were selected by the project team from a listing of contracts with currently open purchase orders. from the files of the Metro Department of Public Works.

We reviewed the contract files in each area of retention within the Department. The original contract documents are retained in the Office of the Metro Clerk and original purchasing documents are retained in the Purchasing Department. Our expectation of the file reviews is that the departmental files would include all materials needed to manage those contracts both operationally and financially, as well as copies of official file materials—such as bid documents and contracts—since those files are retained offsite, creating a potential difficulty for prompt review of contract conditions. However, this was not the case.

In total, we performed a detailed review of sixteen contracts administered by the Public Works Department. These included annual supply contracts, annual asphalt and concrete contracts, individual project contracts, and service contracts for solid waste collection.

Our observations based on the contract reviews relate to operational observations that are made in other sections of this report, and should be considered from both the managerial and operational context. The findings from the review relate both to financial management as well as overall project management:

- Financial management issues include the following:
 - Only fourteen of the sixteen files contained the original project budget.
 - Only four contained invoice and payment data; the project team was able to locate invoice data on the other files through researching the individual payment spread sheets of personnel in the Public Works Department's Staff Services unit.
 - Where files showed variances between invoices and payment authorizations—either authorizations of the project manager or of the finance staff—there was no documentation of what the differences were and how they were arrived at. Because either the project manager or the finance staff could authorize a variance and there is no consistent payment record between the two, it is possible that the invoicing and payment history records could differ between the project manager and the finance office.
 - While the financial staff and project staff indicated that they verified quantities where appropriate before approving invoices, that was not documented in the files; typically that back-up material was in project field notes, which were not part of the financial files.
 - Three of the files were missing both the Insurance and Bond Certificates; three others were missing the Bond Certificate.
 - Dates are routinely not stamped in appropriate spaces, even at the signing of the contract by the Purchasing Division and the Finance Department.
 - Contract documents were not located in a common area. We found that files were retained in several areas in the finance office, in the construction management offices of Engineering and in Waste Management. Interviews indicated that this diffusion of central document control was, in part, a contributor to the separate record keeping that existed throughout the Department.
 - Budget data were not always immediately apparent. There is not a running list of all actions taken, but rather a paper history that would need to be pieced together. This is complicated by the separate record keeping as well as the fact that the paperwork in the files were not maintained in a chronological order.

- Project management issues that the contract review indicated include:
 - Inspection data is kept with the individual inspector and is not generally included in the contract file. We were unable to locate any central record for inspection data for any given project.
 - Project memos are not necessarily included in the contract management files. This may be because a great deal of correspondence is conducted over e-mail. However, for both project management purposes and public record keeping, all e-mail correspondence should be printed in hard copy and included in the project files.
 - Thirteen out of 16 contract files were missing either the First Date Worked or Notice to Proceed document or both. This is critical project information in that it serves as the baseline for project scheduling, compliance inspection, and triggers for date-based performance.
 - Only one file contained field authorizations and compliance orders. In all other cases, the project staff had to go to original records of the project manager and/or inspectors to locate that information.
 - ADA material was never in the file. Only in the past two weeks has the Department initiated a reporting system for ADA compliance inspections; before that, inspectors were reporting that they had been conducting those inspections, but there is no documentary evidence of that. The new reporting form should correct that problem.

One additional note is relevant to this discussion. As part of the contract review, the project team sought to compare the pricing estimates against either project bids or actual project costs. MAXIMUS project staff randomly reviewed twelve paving contracts to compare initial estimates to project costs; in all twelve cases, we found that the costs were either at or below original estimate. Even so, this finding needs to be considered conservatively. The manner in which the Department uses annual contracts renders the data relating both to base estimate and to project cost as questionable. This is particularly the case for resurfacing and contract work. In these instances, the Department awards annual contracts based on price and quantity; there are currently four vendors under annual contract for this work. The Department then uses purchase

orders to assign work to a vendor; there may be several purchase orders relating to the same contract and/or project. In order to determine overall project cost, it would then be necessary to track the specific purchase orders to the given project. Again, because of the way in which the various files relating to any single project are maintained, this tracking is difficult at best.

The implication of this review is that Metro Department of Public Works does not maintain adequate files to provide proper project management and reporting. Its methodology results in a slower contract review and approval process. Further, once a job is completed, because contract data is kept in different places, it may slow down related work at a later date. Overall, the lack of protocol makes the contract filing system an administrative drain of energies that could be devoted to other contract activities.

In the next section, we discuss in greater detail issues around the Department's capital project management as they relate both to the issues described above and to broader issues concerning an effective project management system.

2. MANAGEMENT OF CAPITAL PROJECTS ALSO NEEDS TO BE IMPROVED.

Industry standards have identified several project management principals that should be applied to each phase of the capital improvement project, from design to construction inspection, to final acceptance. These standards describe the following eight steps which comprise the core project management process:

- Preparation of a project budget.
- Definition of the project, including its scope, staff resources required, project costs, and project priority.
- Establishment of plans and schedules of each capital improvement project to determine that tasks are to be performed internally and by private contractors, as well as the start, end and milestone dates. Further, project managers should identify the specific staff and skills necessary to complete the project.

- Monitoring and reporting the progress against each element of the schedule for each project.
- Maintenance of the financial control systems necessary to ensure timely reports on current expenditures of funds for each line item of the project.
- Development of a system to alert top management to cost, schedule, legal and other difficulties and unusual circumstances encountered during the course of the project.
- Management of the staff and consulting resources involved in the project in order to adjust to changes in priorities and project mixes as well as to enable completion of the project on schedule and within budget.
- Management and coordination of the interfaces needed to complete the project.

Underlying all of these principals is management accountability within the Engineering Division and the staff responsible for directing and controlling each Capital Improvement Program project to ensure it is accomplished on schedule and within budget. Additionally, project managers should be capable of identifying legal, accounting and other technical issues, and assigning or procuring staff with the requisite skills to ensure that these issues are handled appropriately. Within the Department of Public Works, the Engineering Division has primary responsibility for management of the capital project process and the projects themselves. As noted in the first section of this chapter, the Department divides financial management between Engineering and Staff Services.

The MAXIMUS project team review of the Engineering Division has identified a number of issues associated with how well the Division applies these eight capital project management principals. These issues include:

- Staffing requirements for all of the capital improvement projects that are currently funded or likely to be funded have not been fully defined.

- Cost of construction guidelines are not fully utilized to determine the design, inspection and construction management staffing requirements for capital improvement projects.
- Staffing resources are not “leveled” to fit the design, construction inspection, and construction management workload to the available staff resources.
- A time accounting system is not utilized to record the allocation of staff hours for the design, construction inspection, and construction management by the staff of the Capital Projects Management Section.
- “Utilization” targets have not been set for engineering staff for the design, inspection and construction management of capital improvement projects (what proportion of their time should be charged to capital projects versus training, leave, administration, etc.).
- A Gantt or bar chart schedule has not been prepared for all of the capital projects that are currently funded and will be designed and constructed over the next twenty-four months. This would be a single chart indicating the sequencing of each project in terms of planning and scoping, design, and construction (including inspection and construction management).
- Monthly capital improvement program status reports are not clear and easily read.
- Capital projects are not fully scoped, and construction cost estimates are not developed before commencement of design.
- Project managers do not have access to the Metro Nashville automated financial management system, FASTNET.
- Feedback mechanisms (e.g., final reports) have not been developed for quality assurance purposes.
- A project management procedures manual has not been fully developed (although the Division has made significant recent strides in developing such a manual).

A number of steps need to be taken by the Engineering Division to improve the management of capital projects. These recommended steps are presented below.

Recommendations 4-1 through 4-10 constitute a series of recommendations for the improvement of the Capital Projects Management Process. There are no costs associated with these recommendations since they relate to operating procedures. However, based on our experience with other governmental units, the MAXIMUS project team anticipates that the Department will experience a significant improvement in the overall effectiveness

of its capital management program. This effectiveness will be observable in improved record keeping, greater timeliness, better cost control and financial management, and a vastly enhanced ability to provide project information to policy officials, other departments, and the public.

Recommendation 4-1. The responsibilities for Capital Projects management need to be clarified.

Requirements for managing each step of the process need to be clearly identified as the responsibility of the Engineer 3 assigned to lead the Capital Project Management Section. These requirements need to be clearly defined, and the Engineer 3 held accountable for their delivery. These requirements are described in the text below and a following exhibit.

- **Planning and Organizing the Capital Improvement Program.** Planning of the Capital Improvement Program projects is essential to the development of a workable approach to completing these projects on schedule and within budget. Key development requirements for management of the process include the definition of each capital improvement project through the completion of a project statement, preparation of a detailed schedule for each project (via an automated project planning system); the preparation of a 2 year schedule for the entire funded Capital Improvement Program; the projection of staffing requirements to handle planned, prioritized projects; and the “leveling” of these staffing requirements to assure the work does not exceed staff capacity. This planning is designed to tie project tasks and their schedules for completion together with specific staff resources within the Division or by contractors.
- **Project Monitoring and Reporting.** The project manager is required to assess the financial and scheduling status of each project. The project manager should be able to extract meaningful information from these status reports, not only in terms of a particular project’s current position, but he or she should also be able to extrapolate this information to make forecasts of future positions as well. Variances from the budget and schedule should be reported via this financial and accounting system as well.
- **Management of Capital Improvement Program Resources.** Management of the Capital Improvement Program process is as much concerned with keeping the project moving after it has started as it is with planning. Management of resources proceeds directly out of the variances identified in the monitoring and reporting phase, and the project manager is concerned with correcting these variances.

**MANAGEMENT REQUIREMENTS FOR THE STEPS
IN THE PROJECT MANAGEMENT PROCESS**

Component of the Capital Improvement Process	Requirement	Responsibility
<p>Planning and Organizing the CIP Upon Mayor and Council Approval</p>	<ul style="list-style-type: none"> • Preparation of a design authorization form for each CIP project to define the financing, description, scope, design considerations, and the necessary coordination with outside agencies (e.g., TDOT, etc.). This process should also include an indication of whether an EIR is required and right of way acquired, as well as a determination of staffing requirements based on application of percent of construction guidelines, or others as developed by the Section. • Preparation of a network schedule using Microsoft Project for each project, including duration time for each task, and earliest and latest start and final times. • Preparation of bar chart schedules for the entire CIP for a 2-year period showing projected timing of planned projects by major project component (e.g., design, bid, award, construction, etc.) • Projection of staffing requirements to handle planned, prioritized projects for next fiscal year, including workload loading on a monthly basis. • Leveling of resources to enable the development of schedules based on available staffing and other resources. 	<ul style="list-style-type: none"> • Deputy Director – Engineering and Engineer 3.

Component of the Capital Improvement Process	Requirement	Responsibility
Project Monitoring and Reporting	<ul style="list-style-type: none"> • Reporting via the time accounting system of actual staff-hours by skill level and position type on CIP projects to provide the basis for: <ul style="list-style-type: none"> - Monitoring of staff and contractor performance against guidelines during each phase of the process. - Monitoring actual versus projected staff needs. - Development of a database to utilize in refining project workload estimates. • Reporting of project status on a monthly basis, including status of staff hours planned vs. actual. • Reporting of financial status of each project showing expenditures to date versus the plan. 	<ul style="list-style-type: none"> • Engineer 3 with input from project managers. Public Works Inspectors should be a key part of the process of gaining insight into contractor performance. • Finance Division should report project financial status monthly.
Management of the CIP Project Resources	<ul style="list-style-type: none"> • Recommending within the monthly status report steps which can be taken to enable completion of projects on schedule. • Communication to top management within the monthly status report of CIP projects which will not be completed on schedule and within budget, along with estimated completion dates for each of these projects. 	<ul style="list-style-type: none"> • Engineer 3 with input from project managers.

Key system requirements include defining within the monthly report the steps that need to be taken to restore projects back to schedule, and alerting top management when projects will not be completed on schedule.

Although the specific duties and responsibilities are defined in the exhibit, general goals and objectives for each of the positions within the Engineering Division and the Finance Division are presented below:

- The Engineer 3 should be accountable for delivering Capital Improvement Program projects on schedule and within budget, and for managing the Capital Improvement Program process, including project selection and prioritization.
- The staff within the Capital Projects Management Section should serve as project managers for those Capital Improvement Program projects to which they have been assigned. Further, they should assist the Engineer 3 in the management of all status monitoring and performance regarding project implementation, including:
 - Implementing initiatives to accomplish Capital Improvement Program projects on schedule and within budget.
 - Defining and securing the staff resources needed for the project.
 - Assuring that all project plans and schedules are defined.
 - Monitoring and reporting progress and problems in meeting Capital Improvement Program plans and schedules.
 - Managing and coordinating interfaces between various staff of the Engineering Division and the Finance Division.

The individual project manager from the beginning of the project to its final conclusion should fulfill the management responsibilities listed above. This is a concept of “cradle to grave” project. Further, this concept will increase the depth of knowledge of specific projects by employees, as one individual will be assigned, and accountable, for the specific project.

Eight key elements of project management were outlined above. The exhibit following this page presents a project sequencing for the Capital Improvement Program process defining how each of the project management components noted above fits into the overall process.

Recommendation 4-2. Prepare a summarized twenty-four month bar chart schedule for all of the capital projects that will be designed and inspected by the Capital Projects Section.

This schedule should portray start and finish dates for each capital project by simple activity descriptions for design, bid package preparation, advertise/award, right-of-way acquisition, environmental impact reports, and construction. This schedule should be prepared for all capital projects that will be assigned to the Capital Projects Section during the next twenty-four months based upon the estimate by the Assistant Public Works Director – Engineering of the available funding for capital projects during this time frame.

The Engineer 3 is currently working on such a twenty-four month schedule. This bar chart should be updated on a monthly basis using Microsoft Project.

SEQUENCING OF PROJECT MANAGEMENT ACTIVITIES

STEP	ACTIVITY
1	Analysis and assessment by the Public Works Department based on a determination of infrastructure repair, construction and maintenance requirements.
2	Submittal of the Capital Improvement Program budget requests, including the solicitation of Capital Improvement Program project requests within the department; preparation of financial analysis and development of financial strategies; analysis and prioritization of Capital Improvement Program projects.
3	Definition, planning and organization of Capital Improvement Program projects for Metro Nashville. These project management components include the definition of the project through the creation of design authorization forms, preparation of project schedules; determination of staffing requirements for each project; resource leveling to assure that workloads do not exceed staff or contractor capacity; and preparation of a master schedule for the Capital Improvement Program for a minimum of 24 months.
4	Preparation of environmental reports if the project is considered to have a potentially significant environmental impact.
5	Preparation of construction drawings and specifications for each project.
6	Acquisition of land or right-of-way, including site selection, approval, negotiation and purchase or condemnation.
7	Procurement of necessary permits or clearance from other agencies, utilities, other.
8	Advertising of bids, selection of contractor, award of construction contracts.
9	Construction improvements, including construction inspection and contract administration.
10	Capital Improvement Program project closeout. This step includes the final acceptance of the project and the processing of final payment.
11	Evaluation of the progress of the project in terms of its adherence to budget and schedule. Any deviations should be reported to top management. This process of monitoring and reporting commences with the design of the project.
12	Management of Capital Improvement Program project resources and schedule. Project managers should take the actions necessary to keep the projects on schedule and within budget, including analyzing the causes of variance, determination of their magnitudes, and directing the actions to correct the variances. This process also commences with the design of the project.

Recommendation 4-3. Microsoft Project should be more fully utilized for the scheduling of each project.

The Engineering Division has acquired and is utilizing Microsoft Project. This use of this software should be expanded for project management as noted below.

- Inputting all capital projects that are funded and that will be designed and inspected during the next twenty-four months, including those that will be designed and inspected by TDOT;
- Adjusting schedule duration based upon monthly narrative statements generated by the engineers or construction inspectors assigned to capital projects;
- Inputting actual cost data for the project for the previous month to maintain life-to-date cost data for the project.

All projects should be scheduled using network diagramming or time scale critical path method arrow diagrams. Gantt charts could be utilized for less complex projects.

Microsoft Project should be updated every month as part of the process for generating the monthly capital project status report. The resource-leveling component of Microsoft Project should be utilized to assure schedules are realistic. Whenever conflicts occur between the desired completion dates and the completion dates generated by resource leveling, these issues should be raised to the Engineer 3 and the Assistant Public Works Director – Engineering.

The Engineer 3 is scheduling training for all of his engineering staff regarding the use of Microsoft Project. This is a logical step. This staff should be utilizing Microsoft Project to manage their assigned capital projects and continuously inform the Engineer 3 regarding the status of these projects.

Recommendation 4-4. Prepare a monthly capital project status report.

The Capital Project Management Section already prepares a number of capital project status reports, as does the Department's Staff Services unit. The Capital Project Management

Section should enhance the quality of this reporting information by preparing a monthly narrative statement regarding each capital project no later than the fifth working day of the month. The following information should be included in this status report.

- Capital project number (based upon the number assigned in the six year capital improvement program);
- The capital project name;
- The engineer or construction inspector assigned to the project (or the consulting engineer);
- A comparison of actual project costs to date versus planned including
 - Design budget;
 - Design expenditures to date separately identifying staff expenditures from consulting expenditures;
 - Construction management expenditures to date separately identifying contract administration, construction inspection, and consulting engineering expenses;
 - Construction cost as budgeted; and
 - Current construction cost as estimated by the Engineer 2 responsible for construction management.
- A comparison of actual project schedule to date versus planned including:
 - The date the design was scheduled to begin and actually begun;
 - The date the design was scheduled to finish and actually finished;
 - The date the City Council was scheduled to award a contract for the construction versus the actual (or new estimated date);
 - The date the construction was scheduled to begin and actually begun; and
 - The date the construction was scheduled to finish and actually finished.
 - The current status of the capital project containing explanations such as 30% design complete.

After distribution of this status report, it should be the basis of a monthly meeting between the Engineer 2's, the Engineer 3, and the Assistant Public Works Director – Engineering.

This status report should be “posted” to the Engineering Division’s web site.

Recommendation 4-5. More complete guidelines should be utilized to document resource requirements for the design and inspection of capital improvement projects.

The exhibit presented following this page presents an example of guidelines for the design and inspection of capital improvement projects as a percentage of construction. These guidelines have been developed based upon data developed by the American Society of Civil Engineers (ASCE) in their publication entitled *Consulting Engineering: A Guide for the Engagement of Engineering Services*. The ASCE stated that the percentage of construction cost “has been widely used for determining the compensation of consulting engineers on assignments where the principal responsibility is the design of various works, and the preparation of drawings, specifications, and other contract documents as necessary.” The following points should be noted concerning this cost of construction guideline.

- These guidelines were developed to “fit” the different types of work activities in each capital project. These include planning and scoping, design development, design survey, design administration, construction survey, construction inspection, construction management, and project closure.
- The guidelines are expressed as a percentage of construction (e.g., the cost of staffing as a percentage of construction). To determine the number of staff hours required, divide the cost of the work activity based upon the cost of construction guidelines by the hourly salary and benefit cost of the engineer assigned to the project.
- Two different levels of complexity are noted: average and above average. An above average level of complexity should be based upon the need to deal with other agencies (e.g., TDOT), the design complexities of the project, or problems with planning and construction (e.g., traffic staging). As a general rule, no more than one out of three capital projects should be above average complexity.

Allocation of Staff Resources for Design and Inspection As A Median Percentage of Net Construction Costs

Type of Project	Street Construction				Street Reconstruction			
	Above Average		Average		Above Average		Average	
Level of Complexity								
Construction Cost (+/-)	\$0.25 million	\$1 million	\$0.25 million	\$1 million	\$0.25 million	\$1 million	\$0.25 million	\$1 million
Planning and Scoping	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Design Development	10%	8%	9%	7%	13%	11%	10%	8%
Design Survey	1.5%	1%	1.5%	1%	1.5%	1%	1%	0.5%
Design Administration	2%	2%	1.5%	1.5%	2%	2%	1.5%	1.5%
Construction Survey	3%	2.5%	2.5%	2%	2%	1.5%	1.5%	1%
Construction Inspection	5%	5%	4%	4%	5%	5%	4%	4%
Construction Management	3%	3%	2%	2%	3%	3%	1.5%	1.5%
Project Closure	0.4%	0.1%	0.4%	0.1%	0.4%	0.1%	0.4%	0.1%
Total	25.4%	22.1%	21.4%	18.1%	27.4%	24.1%	20.4%	17.1%

- The guidelines identify resource requirements for each work activity associated with a project.
- If a consulting engineer is accomplishing the design, the engineer in the Capital Projects Section would utilize the guideline for design administration, and not design development.

The Engineer 3 and Engineer 2 should utilize these guidelines to determine the staffing requirements for each capital project before the commencement of design.

Recommendation 4-6. A design authorization form should be completed before commencement of design.

Only the Deputy Public Works Director – Engineering or the Director of Public Works should authorize the initiation of design of a capital project before its commencement. Design of a project should not be initiated until the resources required (staff hours and construction funding) for completing the project have been identified using the design authorization form.

The design authorization form should include the components enumerated below.

- The project title including the phase of the project, if relevant.
- A general project description including a narrative summary description of the project, specific physical improvements included, the location of the project, and the relationship to master plans.
- The capital project number (as noted in the six year capital improvement program).
- The financing and the cost including the source of funds, and the appropriation status.
- A budget covering the project management staffing, appropriate consultants, property acquisition, utility relocation, etc., by major expenditure component.
- The responsibility for completing the various components of the capital project including the following:
 - Design (in house staff, TDOT, or consulting engineer).
 - Construction inspection (in house staff, TDOT, or consulting engineer).
 - Environmental impact report required;

- Right of way acquisition required and, if so, the number and APN of the parcels.
- Utility relocations required, problems with relocations, and timing issues.
- The preliminary schedule for completing the design and construction of the capital project including the schedule for design, bid package preparation, advertise/award, right-of-way acquisition, environmental impact reports, and construction and including the dates of important events such as approval of the award of construction contract by the City Council
- A document control procedure and record-keeping system including contract documents.
- A change order procedure which includes a documented, systematic approach to the handling of construction change orders.
- Organizational structures, management skills, and staffing levels required throughout the design and construction phase. This includes the estimated staffing required in terms of person hours required for design and construction inspection utilizing the cost of construction guidelines.
- Quality Control and Quality Assurance functions, procedures, and responsibilities for design and construction.
- Materials testing policies and procedures.
- Design and construction reporting requirements, including cost and schedule control procedures.
- Design considerations or issues related to the capital project such as complexities of the design.
- Coordination with other agencies required and the key contacts.
- Special requirements likely to affect the project including public hearings or meetings, complex right of way acquisition, utility relocations, interagency coordination, etc.

The Engineer 3 already has much of this information available in different documents.

This information needs to be consolidated into a single document and reviewed with the Assistant Director of Public Works – Engineering.

Recommendation 4-7. A pre-design meeting should be conducted prior to the commencement of design.

The Engineer 2 leading the project is responsible for convening the pre-design meeting. The purpose of this meeting is to provide an explanation of the background of the project, problems to evaluate, alternatives to be considered, preferred alternative, the proposed schedule for completing the project, and the estimated construction cost. The design authorization form should serve as the basis for the meeting.

The engineer assigned to this project, the Engineer 2's for both design and construction management, the Engineer 3, and the Assistant Director of Public Works – Engineering should attend this meeting. As appropriate, representatives of Metro's ADA Office, other affected Metro Departments, and the public utilities should also have the opportunity to participate in order to assure maximum coordination.

If the capital project is to be designed by a consulting engineer, the meeting should not be scheduled until the consulting engineer has been selected. The consulting engineer should attend this meeting.

Recommendation 4-8. A design report should be completed when the design is no more than 10% complete.

The engineer assigned to the design development of the capital project should be responsible for preparing a design report (project evaluation and alternatives study). If a consulting engineer is completing the design of the project, then the consulting engineer would prepare this design report.

The design report should be prepared when the design is not more than 10% complete. The purpose of the design report is to serve as a preliminary design review to enable the

Engineer 2 and the Engineer 3 to review and approve the proposed design approach. More specifically, the design report should:

- Briefly identify the capital project and describes the project.
- Provide a background to the project including project history, whether the project has any outside support or opposition, and whether any commitments regarding the project have been made.
- Define the problem the capital project is intended to solve and the alternatives considered that could possibly solve all or a portion of the problem.
- Outline the detailed scope of the project and the reasoning behind the selection of the alternative utilized for the design and other engineering decisions.
- Outline in detail the design criteria used for the capital project and the rationale for those criteria.
- Set forth the detailed construction costs for the capital project based upon a detailed review of expected problems and the completion of 10% design, and the sources of funding.

Upon completion of the design report, the engineer assigned to the project should schedule a preliminary design review meeting. The engineer assigned to this project, the Engineer 2's for both design and construction management, the Engineer 3, and the Assistant Director of Public Works – Engineering should attend this meeting.

At this meeting, the engineer assigned to the project should briefly review the project, the alternatives selected, the selected alternative and why this alternative was selected, the design and construction cost estimate, special problems not resolved, the project schedule, and the staffing requirements (or consulting engineer) needed to complete the design and construction management.

Recommendation 49. The Capital Project Management Section should utilize a time reporting system to capture the staff costs associated with design and inspection of capital projects. The preference would be for the Department to use systems that Metro is currently in the process of acquiring so that there would be no additional cost impact.

A time reporting system should be acquired and utilized by the Capital Project Management Division. This system should be utilized to capture the amount of staff hours allocated to design and construction inspection of a capital project and the service and supply costs as well. The intent of this system is to identify the actual staff hours allocated to a project versus the planned staff hours.

Metro is currently in the process of acquiring an activity-based costing system. It may be possible that the system would be sufficient to capture the time and costs components of project design; if so, this would provide the most integrated approach to project design and financial management.

Recommendation 410. A final report should be prepared upon completion of a capital project.

Without a formal analysis and distribution for review, the mistakes and weaknesses of one project will almost certainly be repeated on others. The final report should focus on analyzing the good and bad aspects of the completed project, transmitting that information to the staff of the Capital Project Management Section, and providing a convenient summary of the project.

At the completion of the project, the engineer assigned to the project should complete a final report including:

- Project name, project number, and a description of the project.
- The schedule for completion of the project – planned versus actual.
- The design costs for the project – planned and actual including cost per sheet;
- Construction management costs – planned versus actual.

- Construction costs – planned versus actual with an identification of all of the change orders and the reasons for those change orders.
- The staff hours allocated to the project – planned versus actual.
- Whether as-built plans have been completed
- Comments and discussion regarding the project as necessary including unusual conditions encountered during the project such as contractor deficiency, quantity difference, scope change, etc.

This report should be circulated to the Engineer 2's, Engineer 3, and the Assistant Public Works Director – Engineering.

Recommendation 4-11. Engineering Technician 3's assigned to construction inspection should document their inspection work.

Our review of Departmental inspection records indicated the following deficiencies in this area:

- Inspection records were largely manual, maintained by each inspector as that inspector determined most reasonable.
- Inspection logs were not entered into a standardized information data base for Departmental access, nor were they systematically filed.
- While the inspectors asserted that they performed ADA compliance inspections, the project team observed no documentary evidence of those inspections, including any information indicating whether inspection results were forwarded to the ADA Office. As noted earlier, the Department has initiated a reporting system in mid-March.
- The contract review discussed earlier in this chapter was unable to create any specific link between inspection record information, project field orders, and subsequent project change orders.
- Inspectors indicated that they were assigned projects based on relative work load rather than on any system designed to maximize inspection time and minimize transit time.

The documentation of work activity by Engineering Technician 3's during construction inspection needs to be substantially improved:

- Work activity and record keeping needs to include a number of different reports.
 - Daily inspection reports covering all phases of construction observed that day. The report should include unusual occurrences, conversations with the contractor, methods of construction observed, equipment utilized, or verbal agreements with the contractor with copies of the report included in the contract file and another routed to the Engineer 2 assigned to construction management.
 - Construction diaries with a separate diary for each major contract. The information included in the diary mirrors that of the daily inspection report except that it remains in the possession of the Engineering Technician 3.
 - Documentation of inspection of infrastructure such as curb ramps for compliance with ADA requirements.
 - Change order notices should be submitted whenever there are deviations from the plans or specifications resulting in changes of unit quantities describing the change, location, reasons for the change, materials involved and items under which payment will be made, with copies of the report included in the contract file, and two others routed to the Engineer 2 assigned to construction management and the engineer within design that was responsible for design or design administration by a consulting engineer. Currently change orders are based on accumulated field authorizations, the documentation for which is not consistently maintained in a contract file.
 - A weekly report of working days maintained for each contract indicating how many calendar days have expired on the contract and how many unworkable days occurred that week, by day, and total unworkable days to date.
 - A monthly progress report covering the work completed that month and summarizing the work completed for each contract.
- Inspection records need to be standardized and filed with the specific project files.
- Record keeping should be automated as part of the design of the Department's overall project management system. To assist in this, the system should accommodate the use of hand held recording devices, and the inspectors should be equipped with those devices as soon as the management system is in place.

- Inspectors should be assigned projects based on either unique qualifications for a given project or on a geographic basis. Geographic assignment will minimize travel time and provide more work time on site, resulting in improved project performance.

Recommendation 4-12. The document management procedure should be expanded to include a required table of contents and all documents should be maintained in a binder with all of the binders maintained in a centralized location.

The Engineer 3/Capital Project Management Section has developed a document management procedure for capital improvement projects. The procedure should be modified to include a required table of contents for document management for each capital improvement project, maintenance of these documents in a single binder for each project, and the centralized location of this binder (so that all projects are stored centrally). The suggested table of contents is in the exhibit following this page.

Metro is working on a city-wide document imaging system initiative. The Department should take advantage of this initiative and become an early participant. The idea would be for the Department to digitize its records, beginning with current project management records, and then utilize a Departmental intranet to provide on-line access for use by Department personnel and public officials. Similarly, the Department should digitize its mapping, link the mapping to the Metro GIS, and make the information available both through a departmental intranet and Metro's public web site.

Recommendation 4-13. The engineering staff within the Capital Project Management Section should be provided with access to the automated financial system from their desktop personal computer.

Rather than segmenting capital management between engineering and staff services, personnel in both units need to have on-line access to project data. In the case of the engineering staff, this would include access to Metro's financial management system. Metro

should begin immediately providing training to those personnel so that they can be granted appropriate access to the financial management system at the earliest opportunity.

In summary, the management of capital projects needs to be improved given the sizable capital projects that are occurring right now (e.g., sidewalk construction) and those that are planned (e.g., the \$30 million bond issue for road projects). The recommendations above will result in a vastly improved system, with greater effectiveness in capital planning and management.

Table of Contents for Document Management System

Category Title	Category Item
Consultant Selection Process	Scope of Work/Services
	Request For Proposal
	Evaluations
Council Actions	Council Staff Reports to the City Council for Consultant Design
	Council Staff Reports to the City Council for Construction Contract
Contracts	Consultant contract and change orders
	Construction contract and change orders
Design Review	30% - 60% - 90% design reviews
	Bidding
	Addenda
Construction	Shop submittals
	Contractor requests for information
	Daily contractor reports
	Construction meetings and agenda
	ADA Compliance
Project Schedule	Design project schedule
	Construction project schedule
	Monthly project status reports (design and construction)
Financial	Check requests
	Pay requests
	Project budget setup
	Purchase orders
	Monthly financial reports for the project
Correspondence/Communication Plan	City Council/Mayor, Right-of-Way, client department
	Consultant
	Communication plan for the public
	Contractor
	Public
Closeout and Warranty	Utilities
	Releases and affidavits
	Warranties
	M & O Manuals
	Construction Documents (Plans and Specifications)
	As built drawings

Recommendation 4-14. Metro should develop a contract management system for use by all departments. Depending on the approach decided upon, a contract management system could cost from an estimated \$250,000 to \$1,000,000 or more. The benefit of such a system would be an effective means of project management, which should translated into a more efficient use of capital funds and improved public reporting.

Throughout this report, we have discussed—and will continue to discuss—various activities that relate to contract and project management, and we have provided various recommendations for “stand-alone” solutions. The most notable of these include:

- Capital improvement planning
- Project planning and scheduling
- Project reporting
- Use of design guidelines
- Time reporting
- Cost reporting and analysis
- Inspection reporting
- Financial control
- Document management

However, if overall contract/project management is to be effective, all of these various management and reporting elements have to be integrated into a coherent system. In such a system, data entry and reporting would flow from one work activity to another and project managers and public officials would be able to obtain prompt, accurate information about the status of projects. The result should be greater efficiency in planning, constructing, and managing projects and good public reporting.

Currently, Metro has several initiatives which would impact on any integrated project management system:

- The underlying initiative is the implementation of FASTNET, a J.D. Edwards based Enterprise Resource Management (ERM) package for financial management. This system will serve as the core financial management and reporting system from which various other applications will be based.
- Metro is currently in the process of selecting and implementing a labor management system that will capture labor costs for various work activities.
- A third element is an activity-based costing system that Metro is obtaining. This system will integrate with FASTNET and the labor management system to develop detailed activity costs.

Any integrated project management system will need to work in conjunction with these initiatives. Given that these initiatives cover all of Metro and that the Department of Public Works is not the only department within Metro responsible for project management, it would be most appropriate for Metro to consider this recommendation in a Metro-wide context. There are three approaches which Metro should consider. These include development of systems integration/translation applications that links the various existing systems to collect and report information, acquisition of the J.D. Edwards Project Management module and adapting it to Metro's needs, or acquiring a separate project management application that can integrate with the existing applications. The most appropriate approach will depend on development of a plan that addresses the needs of all prospective users.

3. **EIGHT ADDITIONAL STAFF WILL NEED TO BE ADDED FOR THE DEPARTMENT TO FULFILL DESIGN REVIEW RESPONSIBILITIES.**

To assess the workload impact on the Engineering Division, MAXIMUS reviewed four plat maps and their bond estimates for public improvements being constructed as part of the plat. These four plat maps included Andrew Jackson Business Park, Baypointe, Meadows of Seven Points, and Holt Cove. Overall, 40% of the workload will be transferred to the Water/Wastewater Utility Department based upon the dollar value of the improvements. 60% of

the workload will remain including base stone, asphalt binder, asphalt surface, curbs and backfill, monuments, street signs, sidewalks, and traffic signals.

The Engineering Division will require additional staff to enable the Division to participate meaningfully in the development review process and continue to assure the construction of these improvements adhere to Metro Nashville's standard specifications.

Overall, eight staff will be required. This includes the following staff:

- An Engineer 3 to manage the Development Services Section.
- An Engineer 2 and two Engineer 1's to plan check the preliminary and final plats as well as the improvements associated with commercial and industrial building permits.
- A Technical Services Coordinator (as a working supervisor who would also conduct inspections) and two Engineering Technician 3's to conduct construction inspections.
- An Engineer 1 who was assigned to the Codes Department for permit plan checking

Overall, eight staff will be required by the Engineering Division to fulfill its responsibilities for development review.

The responsibilities of the professional engineering staff will include the following:

- Roadway design review of approximately 150 plans submitted annually.
- Sidewalk design review of approximately 600 plans annually.
- Plat review for right-of-way and construction plans of approximately 400 plats per year.
- Calculating the bond requirements for these developments with 65 bonds issued per year.
- Design review meetings twice per month.
- Planning Commission meetings twice per month.

- Administrative duties and meetings with developers and other customers.
- One of the eight positions, an Engineer I, was assigned to work in the Planning Department to assist with walk-in customers as a customer courtesy. Without this position, applicants will need to travel to the Engineering Division office to submit plans for review.

Recommendation 4-15. Eight engineering positions should be added to the Public Works Department to carry out the development review and inspections. This will require an appropriation of approximately \$400,000 for the salaries and benefits of the individuals. The added positions are necessary for the Department to carry out its review responsibilities. These positions are included in the organizational recommendations later in this Chapter.

4. THE ENGINEERING DIVISION SHOULD BE REORGANIZED TO IMPROVE ACCOUNTABILITY.

There are a number of issues with the present organizational structure of the Engineering Division. These issues are presented below.

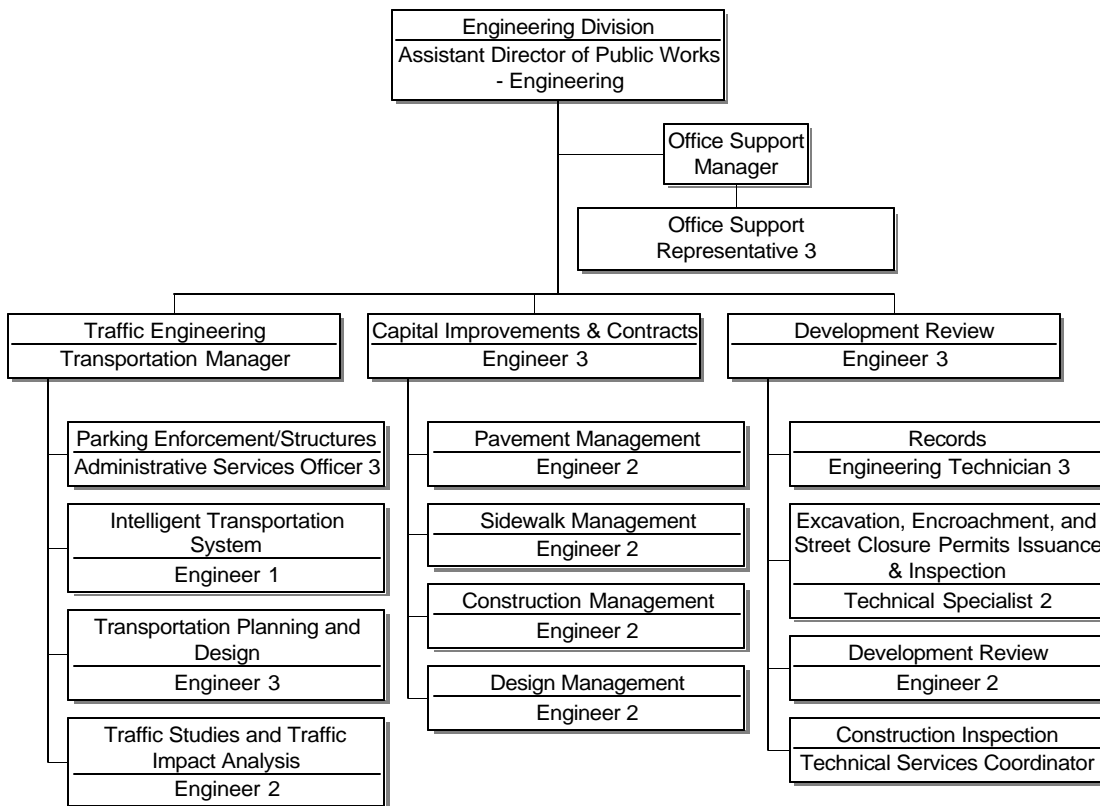
- Some functions are reporting to the Assistant Public Works Director – Engineering that should be delegated to middle managers within the Engineering Division. These include the Permits Section and the ITS Section.
- The responsibility for pavement management is currently assigned to the Streets and Roads Division. Responsibility for managing the preventive maintenance of street infrastructure is usually assigned to engineering to assure adherence to standard specifications and the coordination with capital projects management and construction inspection. The involvement of engineering needs to occur at a number of points within pavement management including:
 - Quality engineering design including proper pavement, base course, and sub-grade thickness, the specification of an appropriate pavement mix design and appropriate grades (slopes) and stormwater collection systems to minimize the deleterious effects of water on the paved surface.
 - Quality installation (construction inspection) including adequate pavement compaction, installation in accordance with the designed thickness, the composition of specified material, the installation of the pavement in the proper conditions and at the proper grades, etc;

- Managing preventative maintenance to keep the paved asset from deteriorating to the point of requiring major rehabilitation or reconstruction before its design life has expired; and
- Recycling and/or reuse of paved assets as appropriate.
- The responsibility for managing parking enforcement and structures is assigned to an Assistant Public Works Director – Parking. The implications of an effective parking enforcement program and on/off street parking has a number of important traffic engineering implications including:
 - Promoting and complementing a comprehensive transportation system through the careful balance of rates and parking supply to encourage the use of the most efficient and economical transportation modes available;
 - Developing and implementing parking management strategies designed to maximize the usage of the available parking supply in order to enhance the economic development of the central business districts;
 - Assisting in the unimpeded flow of traffic in congested business areas by enforcement of parking regulations; and
 - Protecting residents in permitted areas from overflow parking impacts from by business districts, large public facilities, and metro parking.
- Responsibility for development services within the Engineering Division is fragmented. While there is an Engineer 3 responsible for development services, there are development-related functions that report to other managers within the Engineering Division. The Permits Section, which issues street excavation permits, encroachment permits, and street closure permits reports to the Assistant Public Works Director – Engineering. An Engineer 1 within the Capital Projects Management Section plan checks commercial and industrial building permits. The Permits Section also plan checks and inspects public improvements associated with commercial and industrial building permits. The Records Section provides street addresses and names for new development after the plat is recorded, utilizes the Land Information System to maintain the street name index, microfilms plans including plat, grading, and drainage plans, and plat construction plans, etc.
- Responsibility for capital project management is fragmented. There is an Engineer 2 assigned responsibility for construction management. Another Engineer 2 is assigned responsibility for design, primarily bridges. However, three Engineer 1's and a Technical Services Coordinator report directly to the Engineer 3.

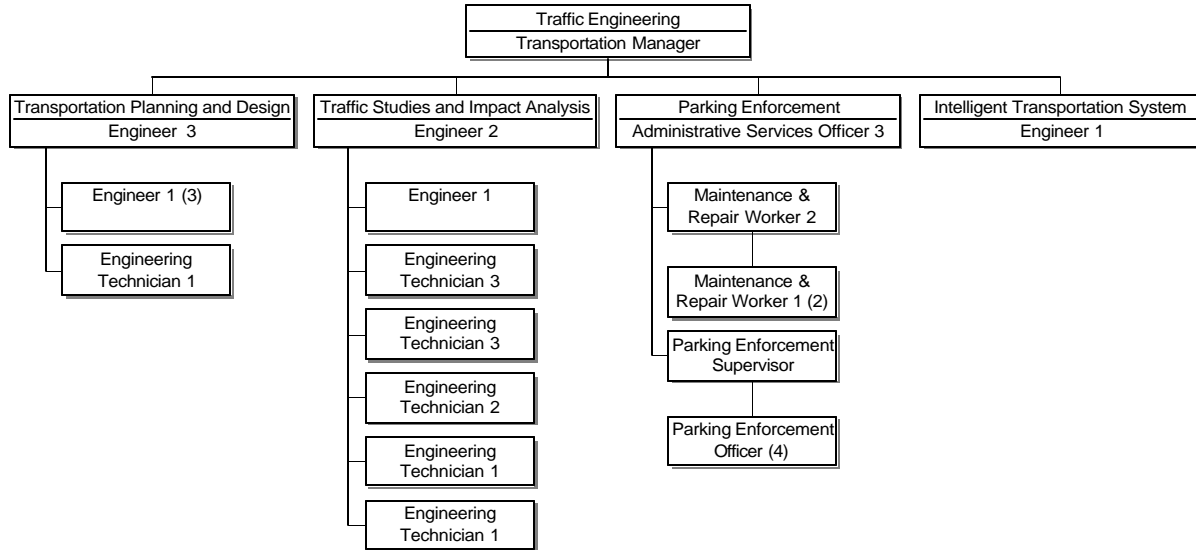
Recommendation 4-16. The following chart presents the proposed organizational structure for the Engineering Division. There is no cost associated with the reorganization itself; however, several of the personnel changes will have some cost implications, and we

present those as they relate to the specific personnel actions in the following detailed recommendations. The MAXIMUS project team believes that this organization will provide for a more effective Engineering Division based on appropriate segmentation of duties and assignment of responsibilities, creation of work units that have specific focus, and the enhancement of a core capital management unit.

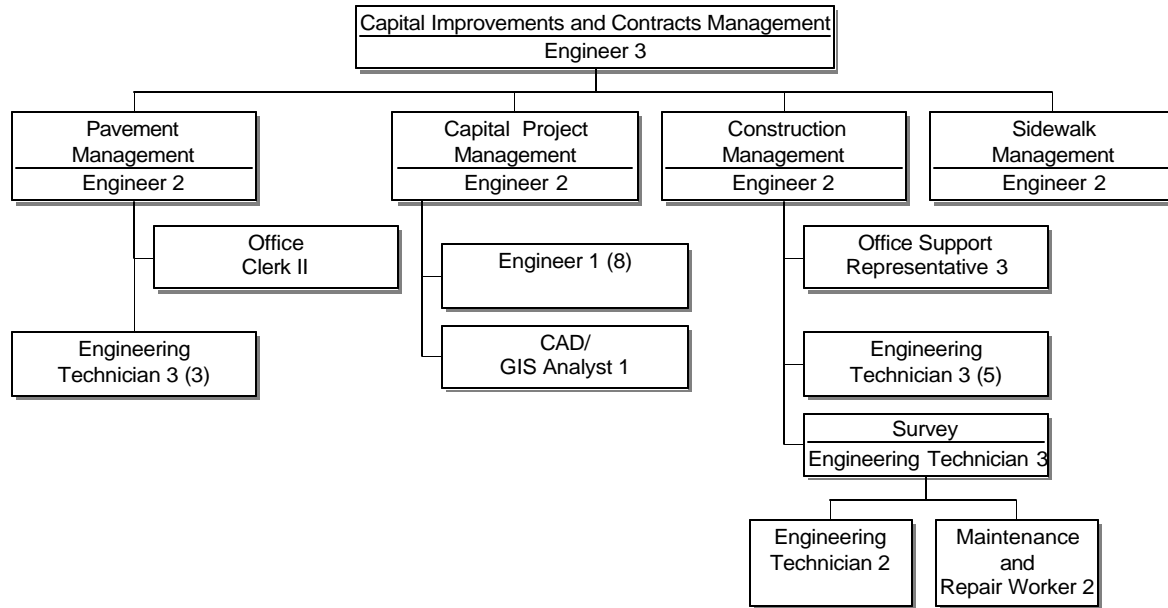
PROPOSED ORGANIZATIONAL STRUCTURE ENGINEERING DIVISION: OVERVIEW



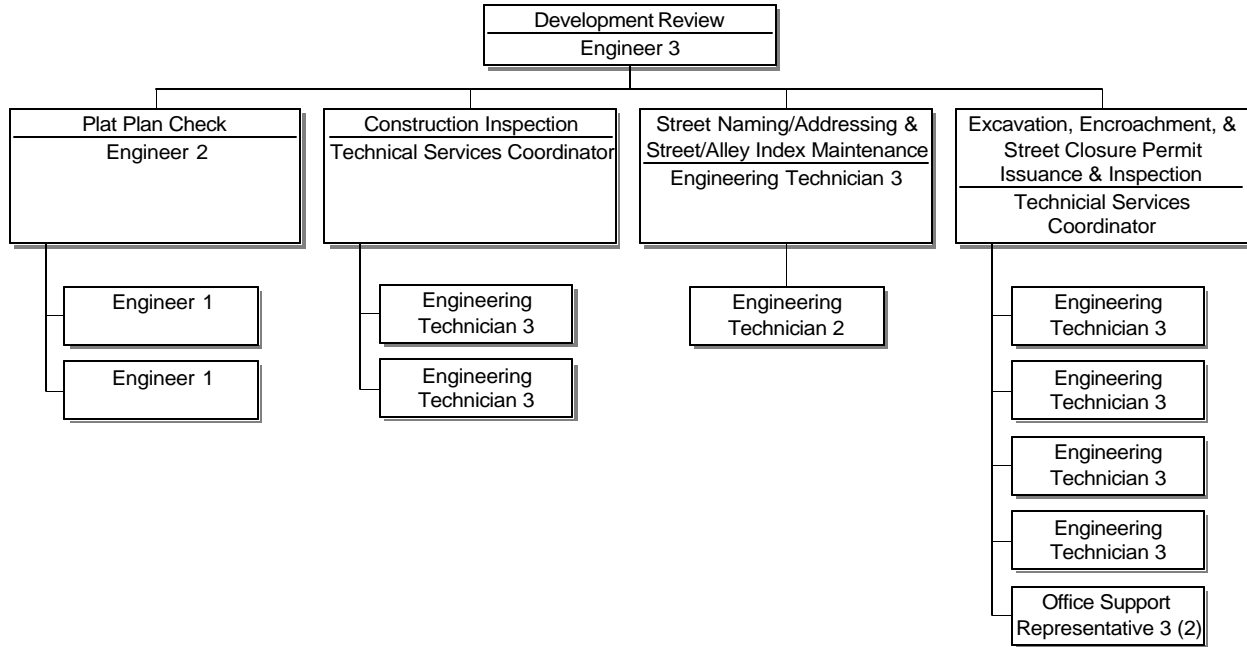
TRAFFIC ENGINEERING SECTION



CAPITAL IMPROVEMENTS AND CONTRACT MANAGEMENT SECTION



DEVELOPMENT REVIEW SECTION



The following table presents a comparison of the staffing in the proposed organization against the existing work assignments. Details relating to the changes in position are discussed in the detailed recommendations after this table.

Engineering Division Matrix of Personnel Assignments			
Function	Current	Proposed	Comments
Division Administration	Asst. Dir of Public Works – Engineering Office Support Mgr Office Support Rep 3	Asst. Dir of Public Works - Engineering Office Support Mgr Office Support Rep 3	
Traffic Engineering Admin		Transportation Manager	New position
Traffic Engineering: Planning & Design	Engineer 3 Engineer 1 (2) Engineer Tech 1	Engineer 3 Engineer 1 (3) Engineer Tech 1	
Traffic Engineering: Studies & Impacts	Engineer 2 Engineer 1 Engineer Tech 3 (2) Engineer Tech 2 Engineer Tech 1 (2)	Engineer 2 Engineer 1 Engineer Tech 3 (2) Engineer Tech 2 Engineer Tech 1 (2)	

Engineering Division			
Matrix of Personnel Assignments			
Function	Current	Proposed	Comments
Traffic Engineering: Parking Enforcement	Assistant Dir (part time) Finance Officer 2 Admin Services Ofcr 3 Maintenance & Repair Worker 2 Maintenance & Repair Worker 1 (2) Corrections Officer (Leadworker) Corrections Officers (5)	Admin Services Ofcr 3 Maintenance & Repair Worker 2 Maintenance & Repair Worker 1 (2) Parking Enforcement Supervisor Parking Enforcement Officer (4)	Position incorporated into duties of Transportation Mgr Reassigned to Admin. All of these positions are currently in the Parking Division Civilianization of position Civilianization of position; reduction of 1
Intelligent Transportation System	Engineer 1	Engineer 1	
Capital Imp rovements and Contracts Management Admin	Engineer 3	Engineer 3	
Capital Improvements: Pavement Management	Technical Svcs Coord. Office Clerk 2	Engineer 2 Office Clerk 2	Reassignment and reclassification from Streets and Roads Reassigned from Streets and Roads
Capital Improvements: Pavement Management (continued)	Engineer Techs 3 (3)	Engineer Techs 3 (3)	Reassigned from Streets and Roads
Capital Improvements: Capital Projects	Engineer 1 (2) Technical Svcs Coord. CAD Analyst 1	Engineer 2 Engineer 1 (8) CAD Analyst 1	Reassigned to Admin. Div., IT Section
Capital Improvements: Construction Mgmt	Engineer 2 Technical Svcs Coord Office Support Rep 3 Engineer Tech 3 (3) Engineer Tech 3 – Survey Engineer Tech 2 – Survey M & R worker 2 - Survey Engineer Tech 1	Engineer 2 Office Support Rep 3 Engineer Techs 3 (5) Engineer Tech 3 – Survey Engineer Tech 2 – Survey M & R Worker 2 - Survey	
Capital Improvements: Sidewalk Management		Engineer 2	
Development Review: Administration		Engineer 3	
Development Review: Plat/Plan Check	Engineer 2 Engineer 1 (2) Engineer in Training Engineer Tech 3	Engineer 2 Engineer 1 (2)	

Engineering Division Matrix of Personnel Assignments			
Function	Current	Proposed	Comments
Development Review: Construction Inspection	Technical Services Coordinator Engineer Techs 3 (4)	Technical Services Coordinator Engineer Tech 3 (2)	
Development Review: Street Naming/Index	Engineer Tech 3 (2) Engineer Tech 2	Engineer Tech 3 Engineer Tech 2	
Development Review: Permits & Inspections	Technical Specialist 2 Engineer Techs 3 (7) Engineer Tech 2 Office Support Rep 3 (2)	Technical Services Coordinator Engineering Techs 3 (4) Office Support Rep 3 (2)	
Total Positions			
	Current		
	In Division	54	
	In Other Divisions	16.5	
	Subtotal	70.5	
	Proposed		
	In Division	68	
	Transferred	2	
	Subtotal	70	
	Net New Positions	(.5)	

The key features of the reorganization are:

- **The responsibility for supervising Permits and Records would be assigned to the Engineer 3/Development Services.** This Engineer 3 would supervise an Engineer 2 responsible for review of plats, the Technical Services Coordinator responsible for construction inspection, the Engineering Technician 3 responsible for Records, and the Engineering Technician 3 responsible for Permits.
- **A separate unit should be established within the Traffic Engineering Section with responsibility for Neighborhood Traffic Management.** The Engineer 3 would supervise this unit. The proactive identification of opportunities to reduce accidents, reduce congestion, and develop long-range transportation plans is a capability sorely missing within the Engineering Division.
- **The responsibility for managing the parking enforcement/structure program should be assigned to the Transportation Manager.** The Assistant Public Works Director – Parking position should be eliminated. The Finance Officer 2 position should be transferred to the Staff Services Division. The Administrative Services Officer 3 should continue to supervise parking enforcement/structures, and report directly to the Transportation Manager.

- **Responsibility for the pavement management program is transferred into Engineering.** The current pavement management unit located within the Streets and Roads Division would be transferred to Engineering under this organization plan. A Technical Services Coordinator currently supervises the Pavement Management Unit. The Unit is staffed exclusively with technical and clerical staff. Given the nature of the problems within the pavement management program and the level of expenditures, it is recommended that a licensed professional engineer position – an Engineer 2 – be added as the supervisor of the unit, and the Technical Services Coordinator position be deleted. The Pavement Management unit would then consist of an Engineer 2, an Office Clerk 2 and three engineering technicians. There is a lot of engineering work required to develop an effective pavement management program for Metro Nashville (e.g., reducing reliance on expensive pavement overlays and increasing the use of cheaper and effective slurry seal and cape seals, discussed later in this chapter).
- **Responsibility for the sidewalk management program should be assigned to an Engineer 2 who will have lead management and project coordination responsibility.** This is discussed in greater detail in the chapter section on sidewalk management.
- **The responsibilities of the Engineer 2 responsible for bridge design should be broadened to include supervision of all staff assigned to the design of capital improvement projects other than pavement management and sidewalks.** This would include supervision of three Engineer 1's and the Technical Services Coordinator presently reporting to the Engineer 3. The Engineer 2 would function as the team leader for design, while the other Engineer 2 within the Capital Projects Management Section would act as the team leader for construction.
- **The responsibility for construction inspection of public improvements constructed as a result of development, including storm drainage, should be retained within the Development Services Section.** These staff would inspect public improvements including streets, sidewalks, curbs and gutters, and storm drains for conformance with standard specifications. While the NPDES program staff were to be transferred to the water/wastewater utility effective April 1, it is important from a segregation of duties perspective that the staff responsible for enforcing the laws regarding NPDES not also administer the laws.
- **The responsibility for inspecting public improvements associated with commercial and industrial building permits (i.e., sidewalks, driveways, curb and gutter, storm drains, etc.) should be reassigned from the Permits Unit to the Development Services Section.**

5. A NUMBER OF STAFF SHOULD BE REALLOCATED WITHIN THE ENGINEERING DIVISION TO ENHANCE THE CAPACITY OF CAPITAL PROJECTS.

There are a number of indications that the staffing within the Engineering Division for capital project management is inadequate given the recent and significant increases in bond funding for capital improvement projects..

The extent of capital projects has expanded considerably beginning in 2001, increasing the workload faced by the Capital Project Management Section of the Engineering Division. The table below presents the bonds issued by Metro Nashville since 1996. Important points to note regarding the data contained within the table include the following:

- In 1996 and 1997, almost \$30 million in bonds were issued by Metro Nashville each year. Almost two-thirds of these bond issues were for roads, bridges, sidewalks, signals/traffic, and Council Infrastructure Projects.
- No bonds were issued in 1998 and only \$2.8 million in 1999.
- Beginning in 2001, the amount of bonds issued increased significantly: \$36.7 million in bonds were issued in 2001 and \$83.4 million in 2002. 64% of the bonds issued in 2001 were for roads, bridges, sidewalks, and signals/traffic, and this percentage increased to 74% in 2002.

CATEGORY	Public Imp Bonds of 1996A	MP Imp Bonds of 1997A	MP Imp Bonds of 1999	GSD MP Imp Bonds of 2001	USD MP Imp Bonds of 2001	GSD Notes of 2002	USD Notes of 2002	GSD APPROP. 2002
Roads	\$6.1	\$7.7	\$2.0	\$2.5	\$0.0	\$30.0	-	-
Bridges	\$2.8	\$4.2	\$0.0	\$3.0	\$0.0	\$0.5	-	-
Sidewalks	\$5.9	\$2.5	\$0.0	\$2.0	\$14.5	\$10.0	\$10.0	-
Signals/Traffic	\$0.2	\$1.3	\$0.8	\$1.0	\$0.4	-	-	-
Storm Drainage	\$3.3	\$5.5	\$0.0	\$1.0	\$7.3	\$6.0	-	-
Environmental - WM	\$10.2	\$0.8	\$0.0	\$2.1	\$1.0	\$1.1	\$0.5	-
Equipment-Fleet	\$0.0	\$0.0	\$0.0	\$0.0	\$2.0	-	\$10.6	\$3.5
Council Infra. Projects	\$0.0	\$7.0	\$0.0	\$0.0	\$0.0	-	-	\$2.0
Street Paving	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$9.2	-	-
Total	\$28.5	\$28.8	\$2.8	\$11.6	\$25.1	\$56.8	\$21.1	\$5.5

Clearly the capital projects management workload for the Engineering Division has increased over the past several years. Yet the Engineering Division has only three engineering staff assigned to design development or design administration. These include an Engineer 2, an Engineer 1, and a CAD/GIS Analyst I. These three staff have the capacity to develop the design of approximately \$3 million in capital projects annually (in terms of construction cost), presuming that the development of design is accomplished with in-house staff, or approximately \$12 million annually if all of the design development was accomplished exclusively with consulting engineers. In addition, the construction inspection of \$15 million in sidewalk capital projects exceeds the capacity of the available construction inspection staff within the Capital Projects Management Section. This doesn't consider the construction inspection workload associated with other capital projects.

A competitive assessment of the cost effectiveness of in-house design for many other public agencies has demonstrated that in-house design of street construction and reconstruction, traffic signals, sidewalks, and other "run-of-the-mill" civil engineering capital projects can be accomplished more cost effectively than consulting engineers with the use and application of effective project management tools.

The Department should adjust its staffing to meet this increased work load that it is undertaking. It three options by which to do so. The first is simply to add additional staff for the new projects. The second is to hire additional consulting engineers. The third is to reallocate and upgrade existing staff so that they are assigned where they are needed.

Recommendation 4-17. Staffing within the Engineering Division should be reallocated to bolster capital project management with the addition of one other position, and the construction inspection of capital projects. The upgrades in positions and the additional position would result in a total increase in expenditures of between \$102,000 and \$120,000 (based on an individual increase of between \$6,000 and \$10,000 per position,

plus fringe benefits). This is the least costly alternative. To hire additional staff would obligate the Department to expend an estimated \$350,000 in annual salaries and benefits; the use of consulting engineers could be expected to result in costs ranging between \$1,200,000 and \$1,400,000, based on variable consulting rates.

The reassignments of personnel are predicated on several possible scenarios.:

- In several instances, the Department currently has vacant positions, which we recommend be eliminated in favor of the increased position levels. In these cases, our interviews and work observations indicate that the vacant positions are not necessary for essential work and the work can be redistributed without adverse impact.
- The reassignment is based on a change in work load or work pattern. For example, the survey crew consists of three persons, while industry standards are calling for two positions with appropriate equipment. In another case, improved work productivity in parking enforcement would permit an equal level of enforcement with one less position. In a third case, the Department has already transferred a position to Street Addressing to due to work load issues.

The proposed reallocations for the Capital Project Management Section are presented below:

- **The vacant Engineering Technician 2 position within the Permits Section should be eliminated, and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.** The Engineering Technician 2 position is vacant, and has been for approximately a year. When it was filled, it was assigned to the office and assigned responsibility for completing the plan check of the smaller commercial and industrial building permits handicap ramps, curbs, sidewalks, driveways and assuring these improvements are built according to standard details. The responsibility for the plan checking of these all commercial and industrial building permits should be assigned to the Development Services Section within the Engineering Division. And in addition, the Permits Section has functioned for approximately one year without the position.
- **An additional Engineer I position should be allocated to the Design Unit within the Capital Project Management Section.** The project team estimates of work load indicate that, in addition to the reassignments discussed in this section, the Section will require one more engineer in order to be completely effective.
- **The Assistant Public Works Director – Parking position should be eliminated and an additional Engineer 1 position allocated to the Design**

Unit within the Capital Project Management Section. The proposed plan of organization for the Engineering Division makes this vacant position unnecessary. The Administrative Services Officer 3 could supervise parking enforcement/structures. The Assistant Public Works Director – Parking has been vacant since the retirement of the incumbent.

- **One of the two Engineering Technician 2 positions within the Records Unit should be eliminated and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management.** This position was apparently reallocated to the Street Naming/Addressing Unit since other units within the Capital Project management could not effectively utilize the position.

- **The Technical Services Coordinator position within the Capital Project Management Section should be transferred to the Information Technology Unit within Public Works Administration.** This position functions as the GIS Coordinator for the Engineering Division. The incumbent of the position performs a number of tasks including the following:
 - Installing software for the staff of the Engineering Division and gets the software up and running.
 - Providing initial/brief tutorials.
 - Providing training in the use of ARC View.
 - Completing the more difficult GIS maps for staff of the Engineering Division.
 - Preparing databases for linkage to ARC Info. Recently prepared the bridges database and set up the procedures for data entry (the actual data was entered into the database by the CAD/GIS Analyst 1). Also recently prepared a database for capital improvement projects digitizing the geographic information and joining the Access database to ARC Info.
 - Keeping AutoCAD 2002 up and running on the network.
 - Serving on the computer committee for the Public Works Department along with two other staff from the Engineering Division. Meet monthly to discuss information technology issues and approve/disapprove software purchases.

The centralized Information Technology Section within Public Works Administration should provide these services to the Engineering Division.

- **A Corrections Officer position within parking enforcement should be eliminated and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.** The discussion of the basis for the elimination of this position is presented later within this chapter as part of the discussion of Parking Enforcement and Operations.
- **Two Engineering Technician 3's should be reallocated from Permits to construction inspection within the Capital Projects Management Section.** In this fiscal year, six additional Engineering Technician 3's were authorized for the Engineering Division for inspection services. These staff were initially assigned to the Permits Section for inspection of utility cut permits, street closure permits, and the like. Since then, one of these six additional Engineering Technician 3's was assigned to construction inspection of capital projects and another assigned to public improvements resulting from development (i.e., streets, sidewalks, curb and gutters, etc.). However, there are six Engineering Technician 3's remaining within Permits for inspection of utility cut permits, street closure permits, and the like.

Two of these Engineering Technician 3's should be assigned to construction inspection of capital projects. A total of four Engineering technician 3's would remain within the Permits Unit. This should be sufficient. For example, on February 25, 2002, the Permits Unit completed forty-two inspections for excavations, complaints and public improvements associated with commercial and industrial building permits. The remaining four staff should readily be able to handle this inspection workload.

This would result in the reallocation of five staff to the design of capital projects and the reallocation of two staff to the construction inspection of capital improvement projects.

6. **METRO NASHVILLE SHOULD INCREASE THE STAFFING FOR NEIGHBORHOOD TRAFFIC MANAGEMENT BY TWO POSITIONS AND FURTHER EVALUATE STAFFING UPON THE FILLING OF THE TRANSPORTATION MANAGER POSITION.**

There are a number of indications that the staffing within the Engineering Division for neighborhood traffic management is inadequate. More specifically:

- Relative to other comparable metropolitan agencies, the extent of traffic engineering staff within the Engineering Division is at the lower end of the range. There are a total of eleven traffic-engineering professionals and technicians within the Engineering Division or 1.9 staff per 100,000 population. This is comparable to the lower end of the range of all other agencies participating in the 1995 report issued by the Institute of Transportation Engineers: Status and Effectiveness of Urban Traffic Engineering Agencies. The average for the twenty-nine agencies with a population of 250,000 or more was

6.7 staff per 100,000 population or three and one-half times greater than Metro Nashville.

- The impact of this staffing level is a division that relies on consulting traffic engineers to address unmet programmatic needs. For example:
 - A consulting firm is in the beginning stages of the development of a bike and pedestrian master plan.
 - The ten most congested intersections in Metro Nashville were evaluated by a consulting firm and improvements identified to reduce congestion.
 - A consulting firm conducted detailed site investigations, identified the thirty highest accident intersections, and developed recommended solutions.

The impact of this level of staffing is also evident in a number of other ways such as:

- The Traffic Engineering Section is unaware of the level of service of intersections unless other agencies or consulting engineers or behalf of developers or the Engineering Division has developed such levels of service.
- Traffic control improvements (i.e., stop signs, red curbing for line-of-sight, etc.) are identified are not studied proactively by staff. Staff is reacting solely to citizen requests.
- The responsibility for design of the traffic calming program was assigned to the Capital Project Management Section and not the Traffic Engineering Section.

In a metropolitan area such as Metro Nashville, the extent of resources and efforts by staff to address traffic congestion, traffic accidents, the impact of development and methods to mitigate those impacts should be greater than those that presently exist.

As part of this study, the MAXIMUS project team reviewed minutes of the Traffic and Parking Commission to consider the impact of the Commission on traffic engineering activities. This review was prompted by the previous internal audit of the Department and by concerns that the Commission was not considering recommendations of staff. Our conclusions from that review were that, while the Commission did frequently make decisions contrary to staff

recommendations, the decisions appeared to be more “either/or” decisions based on limited analysis and less than specific staff recommendations. No research has been done on the historic impact of those decisions, to evaluate whether the actions of the Commission have alleviated or contributed to greater traffic problems. The added staff for this unit would afford the Department the opportunity to conduct more thorough research in pending traffic requests, provide detailed information and well presented recommendations, and evaluate and report on impacts of decisions. More importantly, the staffing would provide the Department the ability to work more directly with resident interests to attempt to resolve traffic concerns in a mutually satisfactory manner.

Recommendation 4-18. Metro Nashville should increase the level of traffic engineering staffing by two positions at an estimated annual cost of \$130,000 and reallocate three other positions for neighborhood traffic management. These assignments will result in more efficient and effective neighborhood traffic planning and will avoid an estimated \$110,000 in additional personnel costs if the positions were not transferred but were added to the workforce complement.

The staffing issues within the Traffic Engineering Section need to be addressed. The programmatic gap within the Traffic Engineering Section that needs to be filled is the capacity for proactive transportation planning and neighborhood traffic management. The efforts made by the proposed Neighborhood Traffic Management Unit includes neighborhood traffic issues such as traffic calming, as well as other proactive traffic engineering services such as evaluating and developing measures to reduce congestion and accidents at busy intersections. The Engineer 3 responsible for managing the Traffic Engineering Section should be assigned as the supervisor for this unit. As noted in the section regarding the proposed reorganization of the Engineering Division, the addition of the Transportation Manager makes the reassignment of the Engineer 3 possible. This position should be utilized to supervise the Neighborhood Traffic Management Unit.

In addition, two other staff within the Traffic Engineering Section should be assigned to this unit. This includes the following staff.

- **The Engineering Technician 2 assigned to Signal Design should be reallocated to the Neighborhood Traffic.** The Engineering Technician 2 assigned to signal design. This position is underutilized. It The position is currently assigned responsibility to maintain an inventory of traffic signals, school flashers, etc., and an inventory of signal capital improvement projects including the date of approval, design, construction cost, etc. This is essentially a record keeping function that does not require full time assignment.
- **The Engineer 1 assigned to Signal Design should be reallocated to Neighborhood Traffic Management.** The Engineer 1 assigned to the signal design section. This position is also underutilized. The incumbent allocates 25% of his time to signal design, 25% of his time to collecting data in intersections for signal design. Fifty percent of his time is used in conducting studies regarding installation/modification of traffic control devices in response to requests from the public (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc. This latter duty is more appropriately a function of traffic engineering than signal design. Given that the majority of the work relates to broader traffic issues than just signals, it would be more appropriate to place this person within the traffic engineering unit.

In addition, it is recommended that two additional professional –level engineer positions be authorized for neighborhood traffic management. The Engineer 3 would supervise these four positions. Their responsibility would be to initiate proactive transportation planning and management for Metro Nashville. This would result in five staff being allocated to this program: the Engineer 3, three professional level engineers, and an engineering technician.

However, longer-term, Metro Nashville needs to assess the level of service it wishes to provide for neighborhood traffic management and the extent of proactive transportation planning and management. Additional staff resources will need to be added, particularly given the addition of a Traffic Operation Center and the Intelligent Transportation System. These staff resources should only be added upon the appointment of the Transportation Manager and the development of a proposed work program with associated staffing requirements. The staffing

for traffic engineering could easily be doubled to meet the needs for proactive traffic management and transportation planning.

7 IMPROVE THE PERFORMANCE MEASURES FOR THE ENGINEERING DIVISION.

A performance measure is an important and quantifiable indicator that determines how well an objective has been accomplished. Performance measures can be grouped into three categories: workload, efficiency, and effectiveness. The Engineering Division has relied on workload measures; it needs to expand its measures to include efficiency and effectiveness.

Recommendation 4-19. The Engineering Division needs to enhance the extent of its performance measures.

- Develop a clear and cohesive framework for performance measurement. The performance measurement framework should clearly define the following elements:
 - The purpose of the performance measurement system and how performance information will be used to manage the division and provide accountability, the relationships and connections between the division's mission, goals, objectives, and performance measures.
 - The link between the sections within the Engineering Division, their goals and objectives, and associated performance measures, management and employee responsibilities for developing relevant measures, establishing timely data collection methods, and reporting reliable performance information, and the frequency and nature of periodic reporting of performance information for operational management and decisions, and for public accountability.
- Simplify the measurement process by selecting a limited set of the best, most useful performance measures that address the Division's highest priorities. The Division needs to develop a good number and mix of performance measures that can be administered efficiently and provide reliable information. The Division should consider first developing a set of measures for budget reporting, and then later expanding the number and type of measures for individual sections. The Division should focus on a few essential measures that address its most important goals and objectives, and give priority to effectiveness and efficiency measures.
- Some representative performance measures would include the following:

- Comparison of capital project design and management costs against industry construction guidelines (These guidelines are discussed earlier in this chapter).
- Adherence to engineered costs, i.e. comparison of final project costs against engineering estimates.
- Timeliness of project completion compared to original schedule.
- Improvement in annual pavement index.
- Completion of plat and plan review in a timely fashion, typically completion within two weeks for 95% of all applications.

7. CUSTOMER SERVICE IN STREET CLOSURE/UTILITY CUT PROGRAM CAN BE IMPROVED BY USING INTERNET ACCESS.

A trend in local government is to use internet access for the receipt and approval of permit applications. In the case of the Public Works Department, internet services could benefit the issuance of permits for street closures and utility cuts.

Recommendation 4-20. The Street Closure/Utility Cut Program should make permit issuance and requirements available on the Internet. This would improve efficiency by reducing the number of walk-in customers that the Department works with and improve customer service by eliminating a travel step for applicants.

An important objective for any regulatory program in government is to make it easy to do business with. To this end, the Street Closure/Utility Cut Program should make available on the Engineering Division web site the requirements for issuance of street closure, excavation, or encroachment permits. In addition, customers should have the opportunity to submit requests for issuance of street closure, excavation, or encroachment permits on-line at the Engineering Division's web site.

9. MANAGEMENT OF THE CONSTRUCTION OF SIDEWALKS WITHIN THE CAPITAL IMPROVEMENT PROGRAM NEEDS TO BE IMPROVED.

While the recommendations in the preceding sections relating to contract management staffing relate also to the management of the Sidewalk Program, that program warrants some

additional specific considerations because of its size, visibility, and cross over among various divisions of the Department.

Historically, Metro has maintained a sidewalk construction program of approximately 1.0 to 1.5 million dollars annually. This has been substantially increased, to \$15 million in the previous fiscal year and \$20 million in the current year.

Throughout this report, we have identified as issues various work activities that relate to the sidewalk program. These include the manner by which the Department plans and executes capital projects, financial reporting, and project reporting. Our review of those issues as well as a specific review of conditions that are unique to the sidewalk program indicate the following:

- The Department has historically oriented the vast majority of its work and maintenance activity to reporting by councilmanic district. This reporting drives an orientation toward assigning and performing work on the same basis.
- The rapid expansion of the program has not been matched by an expansion of staff necessary to carry out the program. The Department is only now adding field staff who will be necessary to inspect the work, and the sidewalk design has largely been left to prospective vendors based on those vendors' field operations. The previous table in Section 5 of this chapter, presenting the level of capital spending for the department, shows the manner in which the Department's obligations for capital spending has changed without a commensurate increase in support staff.
- The Department's sidewalk inspection program is not well organized. Interviews indicate that nearly a third of an inspector's time is spent in travel from one site to another, and projects apparently are assigned based on staff availability rather than by inspection zone.
- The review of contracts with outstanding purchase orders indicates four dominant contractors performing sidewalk work. This would appear to be a reasonable level of competition for previous work loads, but may cause a problem with the new level of work to be carried out.
- There is some concern within the Department that such a rapid expansion of work will result in increases in unit prices. While the project team's review of contracts did not indicate that situation at this time, it is still a valid point of concern. The review of contracts was based on contracts entered into, for the

most part, prior to the new level of funding. The true test of this concern will occur when the added work begins to be placed for bidding. This comparison needs to be done on internal pricing since prices for concrete work can vary widely from different jurisdictions due to economic factors, labor costs, and supply and demand requirements.

- While there is a program coordinator, the sidewalk program itself is being managed in the same manner as all other contracts, resulting in a diffusion of information.
- The program seems to have elevated frustration both within and external to the Department, resulting in an attempt to develop multiple “fixes”. Additionally, the Department is working with three different oversight bodies: A technical management committee of City and Departmental representatives; a strategic review committee that includes representation from the Department, City leadership, other Metro departments, and external agencies; and a recently announced citizens committee consisting of representatives from various neighborhoods. The Planning Commission has also recently adopted new standards that will impact the program; the changes will affect both the Department and external utilities that will have to respond to the new standards.
- The Department appears to be attempting to respond to project requests from political leaders without a sense of overall prioritization.
- External agencies have expressed concern about the impact of the sidewalk program on their maintenance and construction programs, particularly as it relates to requirements to relocate utility services. Of particular concern is whether responding to the sidewalk initiative could consume a large proportion of their budgets and cause the agencies to have to change their maintenance priorities. The agencies are also concerned about the impact of the City’s ADA compliance agreements on their obligations and costs; external representatives indicate that they have been told about the agreement but have not received a copy or been briefed on its requirements.

The Department is currently undertaking several initiatives to address various concerns relating to the sidewalk program. These include obtaining a contract for a professionally developed master plan and contracting for project management. These can be expected to benefit the overall delivery of the sidewalk program.

Recommendation 421. Based on our review of the sidewalk program, together with our observations and recommendations relating to capital project management in general, the MAXIMUS project team recommends that Metro complete as soon as

possible a detailed sidewalk improvement plan before proceeding too extensively into its current initiative. While there is no direct cost impact per se, a well-developed plan will result in a more effective program, more efficient use of financial resources, and greater customer satisfaction.

Elements of this recommendation include:

- Metro needs to approach the sidewalk program as what it is, a large, multi-year, multi-site project. Industry best practices are that this program would be managed as a single large project with multiple work phases.
- The various pieces of the program that have been initiated need to be brought together as a comprehensive whole rather than continuing as separate activities. This includes coordination of the contracts for sidewalk management, construction management, individual work contracts, and the various public bodies that have been appointed to have various degrees of oversight.
- Elements of the project plan must include:
 - Identification of a specific set of policy goals to be achieved.
 - Development of priorities designed to achieve the policy goals, particularly as the priorities relate to identification of where to construct or reconstruct sidewalks. Recommended priorities include consideration of high levels of pedestrian traffic, large numbers of children or elderly, access to key areas of public assembly (particularly schools and public facilities), potential liability due to defective sidewalks, integration with other potential public works (particularly street and storm drain) projects, and the ability of other users of the right-of-way to accommodate requirements for the relocation of their equipment.
 - The Department needs to determine the capacity of the current contractor base in the metropolitan area to absorb the extra volume of work and develop strategies to maximize that capacity while constraining the potential for growth in price.
 - Development of annual construction plans based either on levels of appropriation or the market capacity, whichever is less.
- Review of several sidewalk contracts indicated that ADA inspection was occurring at the end of the project, with resulting debate between the Department and the contractor for responsibility for costs relating to any after-the-fact compliance requirements. For sidewalks, the proper time for inspection and approval is after the framing has been completed and before the concrete is poured. With the potential for a large number of work sites concurrently, this

may pose a responsiveness problem for the ADA compliance staff. As a result, the ADA program may need to consider its staffing or work with the Public Works staff to assure that those inspectors are fully trained to complete ADA inspections.

- Because of the size and complexity of this program, the Department should assign responsibility to lead personnel who have organizational unity and specifically assigned roles rather than being distributed among several different work areas. This is the reason for the assignment of the responsibility to a specific section within the Construction Management Unit of the Engineering Division's Capital Project Management Section.

10. METRO NASHVILLE SHOULD EVALUATE THE BENEFITS OF CO-LOCATION OF THE TRAFFIC OPERATIONS CENTER WITH THE DISPATCH CENTER/EMERGENCY OPERATIONS CENTER.

The Engineering Division has obtained \$16,526,028 in grants from the federal government for the implementation of an Intelligent Transportation System. The local match for these grants amounts to \$1,368,991. This includes eleven separate capital improvement projects. One of these projects includes the construction of a new traffic operations center.

A Traffic Engineering Section typically staffs a traffic operations center during peak traffic flow periods; many are staffed for twelve or more hours per day. There are four primary functions performed in the control room of the traffic operations center:

- Provide for smooth traffic flow.
- Manage traffic through the use of the traffic control devices wired directly to the traffic operations center.
- Coordinate responses to traffic problems.
- Dispatch signal repair crews.

The dominant feature of a traffic operations center is the CCTV surveillance system. With its row of monitors and two or more operator control stations, this system defines the shape and size of the operations center. A typical traffic operations center includes a computer-

generated graphic display to illustrate traffic conditions (i.e., volumes, speeds, congestion levels, incident locations, etc.). Other hardware found in the traffic operations center includes computers (for logging activities and general database support) and radio systems.

The emphasis, however, is on interpretation by staff of incident response requirements and incident management. The primary responsibility of the staff assigned to these traffic operations centers is to improve traffic flow with incident management (e.g., accidents), determine the optimum response, dispatch remedial resources, coordinate with other departments (i.e., police, fire, etc.), monitor response to these incidents, and monitor and manage traffic control devices to manage traffic flow.

Recommendation 4-22. Metro Nashville should consider the co-location of the traffic operations center with the proposed dispatch/emergency operations center. While the fiscal impact of this study is uncertain, it is reasonable to expect that the potential cost savings for co-location could be significant if the technology issues warrant such joint services. Funding for the study should be available through the grant program for the Intelligent Traffic System project.

These activities by the traffic operations center are a natural match with emergency dispatch by the Police Department.

Location of the center will be influenced by several different factors, one of the most important of which is the location of necessary fiber optic feeds. These same fiber optic feeds could be utilized by the Police Department to link to the backup dispatch center. The costs associated with that wiring will have an important impact on the decision about where to construct the centers. In addition, the building requirements for both the traffic operations center and the dispatch center/emergency operations center are comparable in terms of emergency power requirements, security requirements, and the like.

The facility needs of the traffic operations center and the dispatch center/emergency operations center are comparable in many aspects. These two facilities might well be co-located

to obtain the efficiencies associated with joint construction and shared accommodations. Further analysis should be carried out in the planning stages of this project to determine if this is technically feasible.

The MAXIMUS project team does not believe, based on information available relating to the State's plans, that the co-location of the Metro control center with the State's proposed center is feasible. As we understand, TDOT is developing plans for a control center that will be located within Davidson County but outside of the central core of the City's transportation system. Because it is operationally and financially more efficient and effective for a transportation center to be more toward the hub of a transportation system than on the outlying edge, a more removed site as that for the State's center would not be as effective for the City.

11. SEVERAL CHANGES IN THE OPERATIONS OF THE PARKING DIVISION CAN RESULT IN IMPROVED PARKING OPERATIONS.

In general, the Department's Parking Division appears to be operating reasonably well. Its management is effective and there appears to be little public complaint about its performance. There are three changes, however, which the MAXIMUS project team feels will improve Division operations.

Recommendation 423. The Parking Division staffing should be reduced by 2.6 FTE. There is no cost savings associated with this recommendation, since earlier recommendations have called for the use of 1.6 of the positions for upgrades in the Capital Design Section of Engineering. The other position would be a transfer to Staff Services.

As a result of the organizational realignments recommended earlier in this Chapter and in the Departmental Administration chapter, staffing of the Parking Division can be reduced by 2.6 FTE positions without affecting performance:

- With the recommended merger of the Parking and Traffic Divisions, there is no need for the current Assistant Director-Parking position. This position is currently filled on a three-day per week basis.

- In a subsequent chapter of this report, we recommend consolidation of administrative and finance functions that are currently distributed throughout the Department. This would include transfer of the current Finance Officer II position to the reconstituted administrative unit. With other work improvements to be discussed in the Administrative chapter, this individual would be available for other departmental duties.
- Parking enforcement is performed by six Corrections Officers, including a working supervisor. The Corrections Officers are hired by the Sheriff's Office and serve on 6-month rotations with parking enforcement, patrolling parking meters and parking zones and issuing violation tickets. Over the past two years, the meter enforcement division averaged 5,250 citations per month, or an average of 40 citations per day per enforcement officer. A parking enforcement officer should be able to issue 75 to 100 citations per workday; this is equivalent to an average of nine to thirteen citations per hour per parking enforcement officer. MAXIMUS has observed this daily output in other municipal parking enforcement programs. To achieve and maintain this level of daily output, three to four parking enforcement officers and a working supervisor should be sufficient. This change would result in cost savings—which we have already captured in recommendations for staffing of a capital projects management group in Engineering—assuming the same level of ticketing. To achieve this level of effort, however, will require improvements in automation of the ticketing effort, described in the next recommendation.
- A related point to the productivity of the parking enforcement officers is the timing of their work. Currently the enforcement officers work on a 7:30 to 4:00 basis, with two parking enforcement officers working on Saturday mornings. The City's parking meter hours of operation are from 8:00 a.m. to 6:00 p.m., with the City having a large number of tow zones during the 4:00 to 6:00 period. Ostensibly, the early ending time is due to the Department's reliance on the Police Department for tow enforcement after 4:00; the Police Department, however, indicates that the Parking Division also has tow authority. The Department should stagger starting times on a rotating basis to cover the 4:00 to 6:00 period on a trial basis to determine the ticketing effectiveness. If this is determined to be effective, the Division should begin the shift stagger on a permanent basis. If the change is made within existing personnel, there would probably not be any appreciable change in ticketing activity; the prospective benefit would be to improve clearance of rush hour driving lanes out of congested areas.

Recommendation 4-24. Automation of parking enforcement and data would improve parking operations and provide enhanced management reporting capacity. An automated system would cost Metro between \$125,000 and \$200,000, depending on the system selected, potential integration with the Court systems, and the purchase of remote technology for both parking enforcement personnel and police personnel. The benefits

would be greater employee efficiency in issuing tickets, elimination of manual work load counts, and elimination of manual sorting and processing of tickets. This system will enable the automation necessary to expand ticketing productivity per enforcement officer described in the preceding recommendation.

Two points are relevant to this recommendation. These include the processes for ticket enforcement and management and the Division's management of parking meter and parking zone data, including payments for zone reservations.

- Currently, all meter enforcement is conducted manually in Metro Nashville. This includes both this Division and the Metro Police Department, who also conduct parking enforcement. The enforcement officers issue manual checks. They bring the ticket books to the Department's customer service division, where clerks collate the tickets, manually enter the ticketing data into a localized spreadsheet for Divisional reporting, and transmit the tickets to the Courts. This is a very labor intensive process. The Parking Division and Metro Police should move at the earliest opportunity to identify, obtain, and implement an electronic system using handheld printer units. This system should be either integrated into the City's financial management system and Court systems or have the ability to interface with them.
- The Division maintains its inventory of meters, special parking zones, bagging, and customer invoicing on dBASE III Plus data base operating on a Novell Network. Neither are Metro standards; dBASE III has not been in common use for many years, the City's standard is now NT Servers. Additionally, the software operates in source-code mode and both the program and the data are subject to change by any individual who might have access to the system. As part of a broader strategy to modernize its information technology, discussed throughout this report, the Division should upgrade its parking zone applications to a newer system operating on an NT Server, preferably, integrated with the City's financial management system for the billing function. To the extent possible, the goal of Metro should be to acquire a ticketing system that will also provide a database management system for the parking meter inventory.

Recommendation 4-25. The Department should consider returning to civilian parking enforcement personnel. This would result in an estimated savings of approximately \$15,000 to \$18,000 per year, based on five positions.

The Department's use of Corrections Officers is a highly creative source of parking enforcement personnel. Originally, the Department used civilian personnel, but switched many years ago to entry Police personnel because the Department believed that the change would

result in a more stable and better trained work force. When the Police Department decided to discontinue the program, the Public Works Department worked out an arrangement with the Davidson County Sheriff to provide entry Corrections Officers for parking enforcement. The arrangement was that the Officer's would be made available on a six-month basis from point of initial hire to transfer to Detention duties. While, anecdotally, the arrangement seems to have worked well, one weak spot is the constant recycling of personnel and the need for retraining.

It is the understanding of the MAXIMUS project team that the Sheriff's Office may be considering whether to continue the arrangement. It would be appropriate for the Public Works Department to anticipate changing out the Corrections Officer program in exchange for civilian personnel, who would be compensated at a slightly lower level. A potential additional benefit of the re-civilianization of the function would be the possible use of part-time personnel, enabling a greater staggering of shifts, and a flexible—and therefore more attractive—work schedule for employees.

12. DISCUSSIONS WITH THE METRO PLANNING COMMISSION AND THE CODE ENFORCEMENT DEPARTMENT INDICATE THE ENGINEERING DIVISION PROVIDES RESPONSIVE DEVELOPMENT REVIEW SERVICES.

MAXIMUS interviewed managers from both the Metro Planning Commission and the Code Enforcement Department. In both instances, these managers indicated that the Engineering Division provided responsive development review services. Based on these interviews, the MAXIMUS project team offers the following recommendations for improved services:

Recommendation 4-26. The Engineering Division needs to improve its phone responsiveness to calls from other Departments or from developers. The only cost impact would be the potential monthly charges for additional phone lines if the Department were to install dedicated phone lines. The benefits would be improved turnaround for inquiries from other departments and external customers.

Both departments indicated that the development services staff within the Engineering Division are sometimes difficult to reach by phone. The interviews indicated that developers had also complained to the other Departments about this problem. Our observation of the operations of the Development Services staff indicated that the staff were either in meetings or in the field, causing the problems with answering phone calls. The Department should establish a policy of returning calls within one business day. This might be expedited by having separate lines, with voice mail, for the Planning and Code Enforcement Departments and for applicants. This would enable the Engineering staff to recognize quickly the call and return it in a timely fashion.

Recommendation 4-27. The Engineering Division should locate an engineer in the offices of the Metro Planning Commission to assist in processing engineering conditions of approval. This is the same approach utilized for the Code Enforcement Department. Assuming sufficient work space and office equipment at present, there would be no cost associated with this recommendation; the benefit would be improved customer relations and interdepartmental coordination of plan review.

Recommendation 4-28. Specific development guidelines should be developed for traffic engineering requirements that need to be integrated by developers in preliminary plats. There is no cost associated with this recommendation. It would have the benefit of providing clear guidance to developers and to other departments regarding engineering design requirements for preliminary plats.

13. COMMUNICATION BETWEEN PUBLIC WORKS AND THE ADA COMPLIANCE OFFICE NEEDS TO BE IMPROVED.

The Americans With Disabilities Act (ADA), enacted in 1992, requires that public infrastructure incorporate numerous accommodations for those individuals with physical limitations and disabilities. These requirements were originally developed in 1992, and have been modified and interpreted over the course of the past decade. These modifications and interpretations have been documented in the Federal Register as well as other publications. Guidelines for the implementation of these requirements have been published by ADAAG and

PROAAC, with the result that local governments have endeavored to incorporate the latest guidelines into the design and construction of new infrastructure as well as retrofits of existing facilities. To ensure that these design requirements are incorporated in Metro, the ADA Compliance Office has been established. This organization has the responsibility for acting as a repository for ADA interpretive data, and for inspecting public infrastructure installations and improvements to ensure that these design and construction criteria are incorporated.

Interviews with ADA Compliance Office personnel indicate that, although the Office's Compliance Inspectors at various times have attempted to inspect all, or nearly all, public installations for ADA compliance, this practice is now done on a random basis. In the case of Public Works, Department Engineers submit listings of all sidewalk ramps to the ADA Office. These installations are inspected first by Public Works Construction Inspectors, and then by ADA Compliance Officers on a random basis. If ADA compliance issues are identified, these are documented in a memorandum to Engineering. That Division is then responsible for responding back to the ADA Office regarding either the reasons for non-compliance, or the corrective actions taken to place the specific project in compliance.

The Engineering Division has recently begun the submittal of a standard form for examination by the ADA Compliance Office. This form incorporates the date on which Public Works completed its inspection, the project type, the item (handicap ramp, sidewalk, etc.), the facility name, as well as the address. In reviewing the standard form, the project team makes the following recommendation.

Recommendation 429. The Engineering Division should incorporate the reasons for any non-compliance aspects of the project in its project status reporting. Additionally, the Public Works Department and ADA Compliance Office should develop a protocol on how to resolve problems in engineering design where ADA standards and engineering requirements cause unavoidable incompatibility. This protocol should be reviewed by the

Metro Legal Department for compliance with the obligations and intent of the settlement agreement. Once approved, this protocol would serve as the basis for decision making and coordination between Public Works and the ADA Office. While there is no cost impact in making this change, it will enhance the City's compliance monitoring for overall ADA enforcement.

For instance, ADA does not specifically require that each facet of a project strictly comply with every specification in the Act if there are mitigating circumstances surrounding the project. It does, however, require that there be a statement that projects are built to the maximum state feasible considering the conditions. Both for liability purposes, as well as from an efficiency of operations standpoint, the project team recommends that the Engineering Division begin to make these statements on the standard form, prior to the occurrence of ADA Compliance Inspectors making their follow-up inspections. This will minimize the necessary communications between the two Offices, and will ensure that proper documentation accompanies all projects, not simply those for which the ADA Compliance Office makes random inspections.

Recommendation 4-30. The Engineering Division should continue to revise its Standard Drawings to incorporate ADA design issues. While there is no cost impact in making this change, it will enhance the City's compliance monitoring for overall ADA enforcement.

Recommendation 431. The Public Works Department needs to resolve several outstanding issues with the ADA compliance office and establish procedures to be more timely in future matters. There is no cost impact to this recommendation, but it will serve to enhance communications necessary for an effective ADA compliance program.

During our project review, the MAXIMUS project team observed that there has been numerous communications from the ADA compliance staff to the Department of Public Works, requesting a timely response. These communications related both to plan review and construction inspection as well as inquiries on potential policy matters. Interviews indicate that some of these necessary responses are several months overdue. The Department needs to make

a concerted effort to respond to all outstanding queries and to establish a policy of timely response in the future. An appropriate working policy would be to provide a response to the ADA office within two weeks of any query, unless the ADA office requests a different schedule.

14. THE USE BY METRO NASHVILLE OF SURFACE TREATMENTS, SUCH AS SLURRY SEAL, USED FOR PREVENTIVE MAINTENANCE OF ASPHALT PAVEMENT NEEDS TO BE EXPANDED.

Metro Nashville relies primarily on pavement overlay for preventive maintenance of its street network. It is only expending approximately \$100,000 annually on emulsion additives similar to slurry seal. The primary reliance on pavement overlay is an expensive approach to preventive maintenance of asphalt pavement. While in the coming year Metro Nashville plans to overlay 1,221,500 square yards of street surface (3.75 percent of its road surface), proposals have been made to increase the extent of overlays to ten percent of its paved streets annually. There are other lower cost alternatives available to address these preventive maintenance needs.

- **SLURRY SEAL.** Slurry seal is a mixture of asphalt emulsion, well-graded fine aggregate (sand) and mineral filler (in most cases) mixed with water to produce slurry consistency. Additives such as portland cement, hydrated lime, or aluminum sulfate liquids are often used to aid setting the slurry.

Purpose: Slurry seal will seal minor surface cracks and voids, retard surface raveling, improve surface friction characteristics, and delineate different pavement surface areas.

Existing pavement condition: The existing pavement should not have large cracks that displace under traffic. The existing pavement has to be stable with no excessive rutting or shoving.

Existing pavement surface preparation: Crack sealing and patching must be done enough in advance of the slurry seal to allow for complete curing. Immediately prior to construction of the slurry seal, the pavement should be cleaned with a power broom. A tack coat should be used on dry or raveled pavements.

Performance: The life expectancy of a Type II slurry seal is approximately five to seven years.

Limitations: Slurry seal should not be applied on a pavement where the cracks move under traffic. Slurry seals require longer curing time than chip seals. It should not be placed during rain or if rain is expected before the slurry is set.

- **CHIP SEAL.** A chip seal is the application of a polymer modified asphalt emulsion with a cover aggregate. A single or a double chip seal can be used in the Preventative Maintenance Program.

Purpose: A chip seal will rejuvenate or retard the oxidation of the asphalt at the existing pavement surface, improve skid resistance of the pavement surface, seal fine surface cracks in the pavement thus reducing the intrusion of water into the pavement structure, and will retard the raveling of aggregate from a weathered pavement surface.

Existing pavement condition: The existing pavement should exhibit a good cross section and a good base. The visible surface distress may include slight raveling and surface wear, longitudinal and transverse cracks with a minor amount of secondary cracking and slight raveling along the crack face, first signs of block cracking, slight to moderate flushing or polishing and/or an occasional patch in good condition.

Existing pavement surface preparation: For single chip seals all visible cracks and construction joints should be sealed. On double chip seals all cracks and construction joints greater than twelve inches in length and greater than one fourth of an inch in width should be sealed. When the number of cracks and construction joints to be sealed reach a certain quantity, it may be more economical and practical to place a double chip seal in lieu of a single chip seal and eliminate the sealing of any cracks and construction joints.

Performance: The life expectancy of a polymer modified single chip seal is approximately five to seven years. Double chip seals are reported to give about twice the service life as a single chip seal. This is with the assumption that both type of applications were placed on pavements in like condition.

Limitations: Chip seals should be used only on lower volume roads. The construction season for this work is relatively short. Chip seals should not be placed in cool weather. It usually requires about one month of warm weather following construction for the aggregate particles to become reoriented and properly embedded in the asphalt membrane. The potential for windshield damage is another problem. Loose aggregate not embedded in the asphalt membrane will become airborne and possibly damage windshields of vehicles of the traveling public; this is usually the case if traffic uses the sealed roadway

before the seal is fully set. Traffic noise will also increase after a chip seal is placed.

- **MICRO-SURFACING.** Micro-Surfacing is a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface.

Purpose: Micro-Surfacing has been used to correct certain pavement surface deficiencies including rutting, minor surface irregularities, slippery surfaces and raveling.

Existing pavement condition: The existing pavement should exhibit a uniform cross section and a good base. The visible surface distress may include slight to moderate cracking, rutting, minor surface irregularities, flushed or polished surface and/or severe raveling. The pavement should not have large cracks that displace under traffic.

Existing pavement surface preparation: Crack filling and pothole repairs must be done far enough in advance to allow for complete curing.

Performance: A Micro-Surface performs well on high volume roadways to correct the pavement surface conditions described above. The life expectancy for this surface treatment should exceed five years.

Limitations: Micro-Surfacing should not be used on a pavement with moderate to heavy surface cracks. Due to its brittle nature, it is a poor crack sealer. Micro-Surfacing mixes are very aggregate specific because of the chemically triggered, quick reaction characteristics of the mixture. Micro-Surfacing requires special application equipment. The contractor has to have good experience.

Metro Nashville needs to clearly identify alternative preventive maintenance strategies and the pavement condition that best fits those strategies. Extensive use of pavement overlay is a simplistic and unnecessarily expensive approach to preventive maintenance.

Other treatment alternatives should be considered that includes more extensive use of Type II slurry seal. For each treatment to be considered, a cost needs to be defined, the impact of the treatment on each of the pavement condition indices needs to be defined, and a “trigger zone” needs to be defined. A “trigger zone” is the set of conditions as defined by the condition indices, the performance curves, and any other pertinent data items under which a particular

treatment (e.g., slurry seal) would be feasible. Once the treatment alternatives, the performance curves, and the condition indices are defined, the pavement management model can generate a list of “strategies.” A “strategy” is a major treatment in a particular year, possibly combined with a secondary treatment in a later year and also combined possibly with preventive maintenance and reactive maintenance treatments. Each strategy has an associated present value cost and a present value benefit. The benefit is measured by the impact of each of the treatments contained in the strategy on the performance curve used for the calculation of benefits.

A possible treatment cycle that should be considered by Metro Nashville is presented in the following exhibit. Important points to note include the following:

- The alternative treatment approaches consider the different traffic volume, with lower volume streets receiving longer cycles between surface treatments (e.g., slurry seal) and pavement overlays;
- The cycle for overlay is longer than that being considered by some at Metro Nashville. The pavement overlay for high volume streets would be at fifteen years, and for low volume streets would be twenty-three years.
- The cycle chosen needs to be grounded upon the development of strategies that are tied to the pavement condition index for the street.

**PREVENTIVE MAINTENANCE CYCLE
HIGH VOLUME ASPHALT PAVEMENTS
(Average Annual Daily Traffic Volume \geq 5,000)**

The typical type of treatments and time intervals for this category include Surface Seal at 8 years; Structural Overlay seven years later at 15 years. The cycle is then repeated.

A projected treatment life cycle after initial construction would be:

Surface Seal (e.g., slurry seal)	8 th year
Structural Overlay	15 th year
Surface Seal	23 rd year
Structural Overlay	30 th year
Surface Seal	38 th year

LOW VOLUME ASPHALT PAVEMENTS
(Average Annual Daily Traffic Volume<5,000)

The typical type of treatments and time intervals for this category include Surface Seal at 6 years, twelve years, and eighteen years; Structural Overlay at 23 years. The cycle is then repeated.

A projected treatment life cycle after initial construction would be:

Surface Seal (e.g., slurry seal)	6 th year
Surface Seal	12 th year
Surface Seal	18 th year
Structural Overlay	23 rd year
Surface Seal	29 th year
Surface Seal	35 th year

Recommendation 432. The Department should develop a roadway resurfacing program similar to that described above as a means of maximizing roadway surface improvement at an efficient cost. The estimated cost savings is estimated to be between \$2,000,000 and \$4,700,000 per year when compared to the expanded program being undertaken by the Department. The Department should use experienced contractors to perform the work, applying standards for materials and applications should be equal to, or greater than, the standards established by the Tennessee Department of Transportation for slurry seal treatments.

At present, the City has 32,507,915 square yards of roadway surface which it maintains with an exclusively overlay programs. The following table shows the estimated current level of activity, the implied level for a fifteen and ten year program, and the estimated cost for the City if it were to use the schedule described in this section. There are certain assumptions inherent in this model:

- The Department plans to resurface with overlay 1,221,500 square yards of road surface this year, which is inadequate; the cost estimate for the work ranges between \$4.10 per square yard and \$4.85 per square yard, with an average of \$4.41 per square yard.
- The model assumes that approximately 25% of the roadways are classified as high volume.

- The price for slurry seal can vary dramatically based on the type of slurry seal used; industry standards can range from a fifth to a tenth of the cost of new asphalt. For the purpose of this analysis, we have used one-sixth of the cost.
- At present, the City has an aggressive asphalt recycling program, in which the milled asphalt is delivered to the asphalt contractor, who uses it in a recycled mix and resells the mix to the City at five dollars a ton less than new asphalt. Approximately 35% of the asphalt laid annually is the recycled mix. The Department is concerned that the emulsions in a slurry seal mixture might render milled material inappropriate for recycling. This model, therefore, assumes elimination of the recycling costs, an important policy decision for the City; however some cities, such as Los Angeles, have developed recycling programs that involve slurry seal.

ESTIMATE OF COST DIFFERENTIAL FOR COMBINATION SLURRY/OVERLAY PROGRAM				
(Total Nashville Street Surface = 32,507,915 Square Yards)				
	100 % Overlay Programs			Overlay and Slurry Alternative
	Current DPW Program	15 Yr Cycle	10 Yr Cycle	
Total Square Yardage	32,507,915			
Overlay, High Volume (Est. 25% of Roads)	305,367	541,799	812,698	541,799
Overlay, Low Volume (Est. 75% of Roads)	916,101	1,625,396	2,438,094	1,060,041
Seal, High Volume	0	0	0	474,074
Seal, Low Volume	0	0	0	3,003,449
Total Overlay	1,221,468	2,167,194	3,250,792	1,601,839
Total Seal				
Asphalt, Price Per Square Yard Laid	\$4.41	\$4.41	\$4.41	\$4.41
Purchase Volumes				
Volume of Asphalt Laid	1,221,468	2,167,194	3,250,792	1,601,839
Volume of Slurry Seal Laid	0	0	0	3,477,522
Summary of Estimated Program Costs				
Est. Cost for Overlay	\$5,386,674	\$9,557,327	\$14,335,991	\$7,064,111
Est. Cost for Slurry (at 1/6 cost of asphalt)				\$2,555,979
Total Annual Estimated Program Cost	\$5,386,674	\$9,557,327	\$14,335,991	\$9,620,090

If Metro were to adopt a fifteen year paving cycle, the cost of the program and the cost of the slurry program varies by only \$63,000. However, a fifteen year cycle will result in a

higher maintenance cost per street at the latter end of the resurfacing period, so that the overall life-cycle cost could be expected to be higher. Additionally, a fifteen year program would mean that street surfaces would be improved very infrequently while the slurry program is based on improved road surfaces at least every seven years.

On the other hand, while a ten year program would mean that streets receive major surface improvement nearly as frequently as a slurry program and would be expected to have a significantly lower life-cycle cost than a fifteen year program, the cost differential is significant, with a combined slurry and overlay program being an estimated \$2,000,000 (based on a higher slurry cost) to \$4.7 million less expensive per year.

To indicate the wide use of the slurry seal approach to street maintenance, we include the following table identifying a selected number of jurisdictions which use slurry seal. This list was based on a random internet search of sites for communities which either post their street maintenance schedules or bid awards that indicate the use of slurry. We include in this list communities which represent a wide diversity of geography, climate, and environmental sensitivity.

SELECTED GOVERNMENTS USING SLURRY SEAL PAVEMENT MAINTENANCE (Taken from Google Internet Search, April 16, 2002)		
Albuquerque, NM	Las Vegas, NV	State of California
Arlington County, VA	Lenexa, KS	State of Colorado
Aspen, CO	Long Beach, CA	State of Delaware
Aurora, CO	Longmont, CO	State of Florida
Beaverton, OR	Los Angeles, CA	State of Georgia
Berkeley, CA	Montgomery County, MD	State of Idaho
Bryan, TX	Multnomah County, OR	State of Iowa
Champaign, IL	Overland Park, KS	State of Kentucky
Charles County, MD	Palo Alto, CA	State of Maryland

Clark County, NV	Pasadena, CA	State of Michigan
Clark County, WA	Phoenix, AZ	State of Nevada
Colorado Springs, CO	Portland, OR	State of New Jersey
Columbus, OH	Rockford, IL	State of North Carolina
Corvallis, OR	Sacramento, CA	State of Ohio
Dallas, TX	Salem, OR	State of Pennsylvania
Denton, TX	Salt Lake City, UT	State of South Carolina
District of Columbia	San Diego, CA	State of South Dakota
Downers Grove, IL	San Jose, CA	State of Tennessee
Fort Collins, CO	Sedgewick County, KS	State of Texas
Glendale, AZ	Toronto, Ontario, Canada	State of Virginia
Green River, OR	Vancouver, WA	State of Washington
Hunterdon County, NJ	Washoe County, NV	State of West Virginia
Irvine, CA		State of Wisconsin

Recommendation 4-33. The MAXIMUS project team recommends that the Department undertake the slurry seal program for a period of two years and evaluate both the costs and results to validate the effectiveness and financial efficiency of the program. Assuming that the evaluation concludes that the Department should continue the program, at that time, it would be appropriate to consider elimination of the Department’s street paving and milling crews. If the conclusion is to eliminate those crews, then it would be appropriate for the Department also to consider the feasibility of further reducing the number of M & R Supervisors in the Streets and Roads Division. Recognizing that the work those crews are performing will still be required—although in less quantity—it could be expected that Metro could realize a cost savings of between ten and thirty percent of labor and equipment costs. For the purpose of this analysis, we believe that a cost reduction of \$200,000 per year would be a reasonable working estimate of additional savings.

In conclusion, this chapter recommends significant changes to the manner in which the Department administers its contracts, realigns the Engineering Division to be better able to respond to the increase in service load presented by the City’s commitment to expanded sidewalk and street maintenance, and to coordinate service delivery more effectively and efficiently.

V. DEPARTMENT ADMINISTRATION

In this section, we identify principal issues relating to the administration of the Public Works Department. Administrative functions include human resources, the financial management of the department, information technology, and operational policies and procedures.

Beginning with human resources, the project team identified the following issues in the Human Resources unit of Public Works.

1. **THE DEPARTMENT'S PAYROLL PROCESSING SYSTEM PRESENTS PROBLEMS OF DUPLICATION OF EFFORT AND TIME-CONSUMING ACCURACY CHECKS, HOWEVER THESE PROBLEMS WERE BEING THOROUGHLY EXAMINED AND ADDRESSED DURING THE PERIOD OF THE STUDY.**

Currently, the Office Manager and Office Representative positions are responsible for collecting weekly payroll information by summarizing daily work activity sheets completed by each crew leader, which notes daily exemptions, overtime, and out of class pay. Office Managers are required to maintain a daily log of this payroll data in an Excel spreadsheet. The data are summarized and entered weekly into the payroll processing system. Office Managers note weekly exemptions for each center staff into FastNet, which is reviewed by the Administrative Assistant and submitted to Metro Human Resources. FastNet is an exemption payroll system and does not allow the Department to track leave time by type. In order to maintain accurate records with regard to leave time accrual, Office Managers utilize, Gneil, which allows the monitoring of leave time accrual by type, as well as providing leave time summaries to staff. This is completed weekly with information being updated from the Excel spreadsheet.

The current method for payroll and leave time record keeping requires Office Managers and Office Support Representatives to maintain three separate files, one of which is updated daily. While Special Operations and the East Center are networked, the West Center staff does not have access to the network. Their data are forwarded to the Administrative Assistant, who updates West Center data in Metro's information systems on a monthly basis. While the payroll functions of the Office Managers and Office Support Representatives do not comprise the majority of their daily activities, it is the payroll processing system which creates duplication in data collection and processing. One of the problems in this regard results from the fact that the current system forces Office Managers to retroactively review the time worked by each staff member to ensure that any overtime claimed is legitimate. For example, if an employee works 48 hours in a week, with hours 41 through 48 worked out of class, Metro pays this overtime at the rate of the out of class position, thereby requiring office staff to review this occurrence day by day to confirm the accuracy of claimed overtime by the employee, as the current system is not capable of making the adjustment.

Human Resources personnel at both the Department and Metro level are aware of the limitations of the current system and is examining alternatives to rectify the situation. The project team attended several meetings between Metro Human Resources personnel and Public Works Human Resources staff which addressed these issues, and believes that, although proposed solutions are changing rapidly, the situation is being adequately addressed.

The next issue analyzes the organizational placement of the Office Managers at each of the Streets and Roads Division's three work sites.

2. **THE PROJECT TEAM RECOMMENDS THE ORGANIZATIONAL TRANSFER OF OFFICE MANAGERS AND OFFICE SUPPORT REPRESENTATIVES FROM HUMAN RESOURCES TO THE DIVISION OF STREETS AND ROADS.**

In addition to the positions of Training and Safety personnel in the Human Resources Division of Public Works, there is an Office Manager and an Office Support Representative at each of the two satellite centers, as well as at the central location at South 5th Street, almost exclusively supporting the operations of the Streets and Roads Division. A review of daily activities of Human Resources center staff, data collection/processing methods, and Human Resources support indicate that the majority of job activities performed by Office Managers and Office Support Representatives, who nominally report to the Public Works Human Resources Manager, were not related to the support of traditional Human Resources functions. The daily activities and job responsibilities of Office Managers and Office Support Representatives generally consist of payroll processing, compilation of data for various reports, serving as an intermediary between Metro Human Resources and line staff, and administrative support to centers' supervisors and managerial staff. Additionally, the daily job responsibilities of the Office Manager and Office Support Representative do not include many of the traditional Human Resources functions, such as new employee orientation or benefits administration.

As mentioned in the previous sub-section, payroll data are collected and entered into an Excel spreadsheet daily, and then entered weekly into two additional databases (FastNet and Gneil). This redundancy in the payroll process consumes a significant portion of the actual staff time spent on human resources functions, meaning that while the majority of work performed by the Office Managers and Office Support Representative focuses on assisting Center staff, their activities relating to human resources support focus primarily on payroll processing. The

second primary human resources-related function of the Office Managers and Office Support Representatives is to serve as liaisons between the departmental Human Resources Division and Public Works staff. For the most part, Human Resources Center staff collect completed paperwork and forward it to the departmental Human Resources unit at South 5th Street for processing. Also, Human Resources center staff are responsible for disseminating new policies and information to Public Works center staff, however, it appears that Office Managers and Office Support Representatives receive minimal direction regarding policy interpretations, as well as explanations and training in Human Resources decisions. Rather, the function of the Office Managers and Office Support Representatives has evolved into a function of relaying specific questions and information requests between Human Resources and center staff.

While payroll processing and the dissemination of Human Resources policies and information are the primary human resources functions of the Office Managers and the Office Support Representatives, it appears that the clerical functions of data collection and the development of reports, including payroll, “out of class” and overtime pay, as well as monthly work activity reports and CostSum data comprise a greater portion of their daily activities, rather than traditional human resources responsibilities. For the most part, these reports are assigned and utilized by Public Works Center staff, as well as the Director of Public Works. Human Resources Center staff are also responsible for processing and tracking work orders generated by the call center, using the Automated Inquiry Management (AIM) system work orders, which are received through interdepartmental mail daily. The Office Managers and Office Support Representatives also maintain a separate database, as well as a hard copy of the work orders. In addition to keeping records, Office Managers and Office Support Representatives provide administrative and clerical support, maintaining center files, answering

phones, and preparing correspondence for managers and supervisors. Office Support Representatives also dispatch emergency requests for services to crews throughout the day.

Finally, Office Managers and Office Support Representatives receive daily direction from and provide daily administrative support to Center staff, as opposed to the Human Resources Division of the Department. This presents complications for Office Managers and Office Support Representatives, as they receive their daily job assignments and workloads from Public Works Center staff, while organizationally reporting to the Human Resources Manager. The project team believes that the organizational location of Office Managers and Office Support Representatives conflicts with their specific job functions and responsibilities, especially as they relate to the prioritization of daily activities.

Recommendation 51. The project team recommends that the Office Managers and Office Support Representatives be transferred organizationally from the Human Resources Division to the Streets and Roads Divisions and the centers at which they work. Given that the project team has previously recommended the organizational consolidation of the East and West Centers with that of Special Operations, this would entail each of the six employees at the three Centers to be transferred to the Special Operations Unit of Streets and Roads as well.

The project team makes this recommendation for the following reasons:

- **It allows the management of the Division for whom the clerical staff provide most of their daily work to establish the prioritization of their activities.** – Currently, the Office Manager and Office Support Representative at each of the Centers report to the Human Resources Manager, with whom they only sporadically communicate and receive direction. Observations and interviews indicate that there is a far greater degree of interaction with Center staff, and this interaction is only peripherally related to human resources functions.
- **Once the Department's payroll processing problems are overcome, the time consumed in this function will decrease substantially.** - Currently, the Office Manager and Office Support Representative at each of the Centers spend the majority of their time performing operational activities related to the Centers at which they are located, as opposed to human resources-related functions. This relative percentage of time is likely to be substantially reduced even from the current levels as the Department streamlines the payroll processing activity.

- **Office Managers and Office Support Representatives do not possess any formal training or education in human resources functions.** - Although this is not a formal requirement of the positions, and is not a fault of the incumbents in the positions, neither do these employees provide any added human resources value through their presence at the Centers beyond simply relaying personnel-related documentation to Center staff. As has been discussed above, the functions are primarily clerical in nature, and are not specifically related to human resources, per se.
- **With the increased need for documentation and reporting of daily work activities by field personnel, there is a commensurate need to increase the focus of the Office Manager and Office Support Representative on these functions as well.** – As was discussed in an earlier section of this report, the project team strongly recommends that the Streets and Roads Division begin placing greater emphasis on accumulation and reporting of crew activities. This will necessarily become a function of the clerical personnel at the Centers, and will require a high degree of coordination with Division staff, particularly in the early phases of this effort, to ensure the quality of data.

The next issue analyzes coordination between the Safety and Training functions of Human Resources.

3. **A GREATER LEVEL OF COORDINATION IS NEEDED BETWEEN THE DIVISION'S SAFETY AND TRAINING FUNCTIONS.**

Training and Safety are organizationally separate functions, which report directly to the Human Resources Manager of the Public Works Department. The Training Unit provides information regarding training courses available to staff from Public Works divisions, Metro, as well as other external training providers. It also provides required training courses (i.e. sexual harassment, diversity) and personal development courses. Currently, the Training Unit's focus is on developing a comprehensive list of all training available to Public Works staff. The Safety Unit works to ensure compliance with state and federal laws, and tracks employee compliance with the TOSHA and OSHA requirements, as well as investigates all incidents and accidents within the Department or staff.

Currently, the coordination between the two divisions is focused on the implementation of an information system. The information systems will enable the units to track staff training and re-certification needs. It will also provide Training and Safety staff with information on which decisions can be made, as well as information to improve coordination between those divisions and other Metro departments to determine training needs, available resources, and courses. Because there has historically been little coordination between Safety and Training, staff training needs have historically not been sufficiently identified or met. However, the project team has met with the Training staff and is satisfied that the recently-initiated coordination plan addressing problems and solutions to training issues will result in a better-managed and well-functioning program. However, given the critical link between safety and training functions, improved coordination, communication and working relationships would enhance the level of service provided to the Public Works staff by allowing the units to monitor compliance, establishing advanced planning of courses, and to develop a training program that would prevent redundancy in courses provided by other divisions.

Recommendation 5-2. The Department should establish a goal of integrating training and safety through establishing a formal program of safety training that is focused specifically on the findings of regular safety inspections within the department. No cost is associated with this recommendation, but the expected benefit should be a reduction in preventable accidents in the Department.

4. PERFORMANCE EVALUATIONS SHOULD BE GIVEN MORE MANAGERIAL ATTENTION TO ASSURE THAT THEY ARE USED FOR PROFESSIONAL DEVELOPMENT.

As part of the study, project staff reviewed the personnel files of a randomly selected 66 employees of the Department. The purpose of the review was to determine whether performance evaluations were performed on a timely basis and if the scoring provided sufficient feedback as to constitute appropriate developmental feedback. We observed the following:

- Employee records are kept in file cabinets in a fully accessible clerical work area. While the cabinets had locks on them, they were not locked. This means that any person with access to the area also had access to the original personnel files of any departmental employee.
- Of the 66 files examined, all but 9 had evaluations performed within the last year. Of the nine, all but one had had evaluations performed within the past eighteen months.
- Only one of the files had evaluations had an average score below 2.0 for Section Two (general job characteristics); none had an average score below 2.0 for Section Three (job specific skills). The score of 2.0 is established as the average score.
- The average score for Section Two was 2.22, and the average score for Section Three was 2.28.
- Fifteen of the 66 evaluations had scores of 2.0 for Section Two; 18 has scores of 2.0 for Section Three.
- 27 of the evaluations had rankings in which the score of 2.0 was assigned for at least 75% of the evaluation criteria.

The implication of the tight clustering of the scores is that performance evaluation process is being used as work activity that has to be completed rather than as a valuable tool of management review and employee development.

Recommendation 5-3. The Department should work with Metro Human Resources to develop a training program for supervisors that focuses on meaningful performance evaluations as a means of fostering employee development and encouraging work improvement. The program should start with the Director's Office and go throughout the department. Additionally, the Department's training officer should review all performance evaluations to determine either individual training needs for a given employee or observe any patterns of performance that warrant development of Department-wide training. There is no cost associated with this recommendation, but it can be expected to result in more effective evaluations, enhanced employee training, and better work performance.

A key point to this recommendation is that valid performance evaluation of employee performance must begin with the senior leadership of the Department. Departmental management needs to understand the importance of meaningful, objective performance

measurement and transmit that commitment to all of the employees who work under the respective manager's leadership. Once this attitude has been established at the senior management level, it can then be transmitted throughout the organization at all levels.

Recommendation 5-4. The Department needs to secure personnel files by keeping the file cabinets holding personnel records locked at all times, with key access strictly limited. There is no cost associated with this recommendation.

The next sections of this chapter address financial administration of the Department.

5. FINANCIAL CONTROL PROCEDURES WITH THE DEPARTMENT NEED TO BE IMPROVED.

There are three components to this discussion. The first is the Department's contract management, which was discussed in the Engineering Division chapter of this report. The second is the administration of the Department's invoices and receivables, and the third is fee administration.

(1) The Department needs to improve its accounts receivable and check handling processes.

The project team reviewed the check/cash receiving and handling processes to verify that appropriate controls were in place to assure proper management of funds. This included the functions within the parking and parking zone administration, permitting, and solid waste areas.

In summary, the current process is described as follows:

- The bulk of the Department's monetary transactions are performed by check. There is relatively little cash handling, with the majority of that occurring at the City's disposal sites. Additionally, most of the permitting activity is conducted through the Citywide permit system, using debit accounts.
- Relevant financial staff generate customer invoices based on their own stand-alone information systems which capture transaction history.
- When payments are received, the financial staff logs the payment, endorses the check with a stamp provided by the Metro Treasurer, bundles the checks,

prepares a deposit slip, and gives the bundle to a Financial Officer II for handling.

- The Financial Officer II verifies the checks, prepares a revenue transaction form, and places the checks, deposit slips, and transaction forms, into a transmittal bag.
- The Department's courier picks up the bag in the afternoon, deposits the funds in a City bank account, delivers the transaction form to the Metro Finance Department and returns a copy of the deposit slip to the Financial Officer II.
- Metro Finance records the transaction form and sends an executed copy to the Financial Officer II, who assembles the transaction form and deposit slips and provides them to the relevant finance staff.

In the course of our review of the processes, the project team did not observe any actions that would cause us to suspect inappropriate financial dealings. However, we did observe several practices which either result in insufficient account management or could lend themselves to abuse. These include the following:

- When the permitting staff receive payments, they retain the payments in a locked desk drawer until what the staff feels is a sufficient number have been received. Staff report that, in some cases, this could be a period of from several weeks to a month. Metro cash management policies require daily deposit of all funds.
- In the case of parking payments, the Department's receptionist places all of the mail for the Parking Division's Finance Officer on the Officer's desk. The Officer sorts her mail and either immediately processes all payments or stores the payments in a vault in her work cubicle. This is appropriate management of the checks on the part of the Finance Officer. However, potential for problems occur first, with the placement of potential checks on a cluttered desk when the Finance Officer may be absent. In such cases, that could be as short as a few minutes to several days since there is no back-up for the Finance Officer.
- Although the Department has transitioned payments for solid waste matters to the Waste Management Division (an issue that will be discussed later in this Chapter), some payments are still being received in the Department's main office. The Finance Officer was placing the live checks in routine interoffice mail, without any controls. When the MAXIMUS staff was conducting a review of the control procedures at the Waste Management Division, we observed an interoffice mail pouch that contained six checks for over \$13,000 in value. When we brought this to the attention of the Department's Administrative Officer, he changed the handling process immediately.

- While reviewing the financial management controls around contracts in the Waste Management Division, the project staff observed a case in which the Division was administering funds in a manner contrary to contract procedures. The particular case related to the City's contract for brush handling. The contract provides that the contractor will share profits from the sale of mulch through a discount on future invoices. In fact, the contractor was issuing a check for the payment. There were two different checks, with two different business names, neither of which was a name on the official contract. While the Division personnel knew the source of the checks, an independent audit would have required follow-up reconciliation of the business process.
- Also in the Waste Management Division, we observed that the staff responsible for verifying payment authorizations was simply ratifying approvals since she did not have any independent means of verifying the invoice matter. As well, the contract manager indicated difficulty in verifying invoice data. Both attributed the problem to a lack of monitoring capacity that was inherited when the process was transferred to Waste Management. This issue pertains to every service contract being administered by the Division. The Division is attempting now to identify the service bases for each contract and establish procedures for verifying invoice data.
- A problem common in all of the areas was the lack of the ability to reconcile payments against specific invoices. The finance staff had to assume a connection between payments and outstanding invoices. This would diminish the Department's ability to verify specific financial transactions.

Recommendation 5-5. The MAXIMUS project team recommends that the Department amend its accounts receivable process to minimize check handling and use the procedures being established by Metro. There is no cost associated with this recommendation, but the benefit will be improved controls over checks and reduced work load on staff.

Relevant elements of this recommendation include:

- Metro is in the process of implementing a general accounts receivable system for Nashville government. The Public Works Department should be integrated into this system at the earliest opportunity.
- As soon as practical with the receivables system, the Department should abandon its stand alone systems in favor of use of the capacity of the J.D. Edward's receivables capacity.
- The Department should establish a process by which all payments are sent to the Metro Treasurer or designated contractor, which would open, process, and

deposit all checks, and provide a transaction history. While this could be done independently of the receivables module, it would work more effectively with such a module in place

- All cash transactions should be processed through the use of drop safes, with counts and deposits processed by a contract counting house. Each safe would be equipped with a removable, locked storage box. The Departmental courier would remove the box and transfer it to the counting house. The house would be responsible for counting the receipts and depositing the funds into Metro accounts. This is the model used for parking meter enforcement, and it can be expanded to include these transactions, subject to the same auditing procedures which we describe in the next section of this report.

Metro expects that the change in the receivables process will take at least a year to design and implement. Pending the changes, the Department should implement the following interim steps:

- The Department should designate a central receiving point for all checks. The receiving staff should immediately image all incoming checks and place the checks in a secure location pending pick up and deposit in the afternoon. All information processing should be performed using the image rather than the live check.
- The Department should proceed with the drop safe and counting procedures for cash transactions.

(2) The Department should develop an audit procedure for its parking meter revenues.

Currently, the Department's parking meters are swept on a regular schedule by the parking meter maintenance personnel. The collector opens the meter, ejects the coin box into a locked vault, and replaces the coin box. At the end of the route, the collector turns the vault into a contracted collection agent. The agent opens the boxes, counts the coins, deposits the money into a City depository account, and submits the deposit slip to the Division's finance officer. Throughout this process, there is no means by which the City monitors the fidelity of the processing agent.

Recommendation 5-6. The MAXIMUS project team recommends that the Department develop a procedure to test the accuracy of the collection count.

This can be done by providing the lock box operator with test boxes, the contents of which are known by the City. The operator should provide accounting of the boxes individually in such a fashion that the Department can verify the accuracy of the count. This may require a revision to the service contract to provide more detailed accounting; the benefit would be assurance of proper receipting of all funds due to the City.

(3) The Department needs to administer its fee systems more effectively.

As part of the performance audit, the project team reviewed the Department's administration of its various fees. At point were the basis on which the fees were determined and the level of revenue resulting from those fees.

- The Department is authorized to collect fees for excavation permits, obstruction permits, parking meter occupancy, and right of way temporary closure permits.
- The fee for each transaction is recorded in Metro Ordinance 97-785. While the parking meter occupancy permit fee is set on the basis of the estimated revenue for a parking meter in a given day, the other fees were set based on general recommendations and without any underlying analysis relating to cost recovery.
- In the two-year period from January 1, 2000 to December 31, 2001, the Department collected \$2000 for the issuance of 20 encroachment permits, \$544,816.50 for the issuance of 2,175 excavation permits, and \$67,450 in meter occupancy fees.
- While the Department issues these permits on a regular basis, it does not collect fees for temporary closures. It justifies the action on the basis that the City's permit tracking system is not able to perform the calculations necessary for the fees and the system has not yet been modified to do so.
- The only authority in the ordinance not to collect the fees is a waiver to be granted by the Director for Metro departments and contractors, required utility relocations, actions of governments, or the necessity to close a public way for the immediate protection of public safety; none of these conditions exist to provide a basis for the non-collection of these revenues.

- During the two year period of January 1, 2000 to December 31, 2002, the Department issued a total of 14,196 temporary closure permits. The closure permit has a sliding scale inspection fee from \$10 to \$50 plus \$1 per day for each day after 50 days, plus an application fee of \$15.00. At a minimum, the lack of the fee has resulted in average lost revenues of \$106,500 per year over the past two years.
- Approximately a year ago the Department hired an independent consultant to conduct an evaluation of the costs relating to closure permits. The resulting report provided a detailed basis for recommending a new fee structure. To date, the Department has not submitted a draft ordinance to the Metro Council to authorize the new fee structure.

Recommendation 5-7. The project team recommends that the Department begin immediately to establish the systems and procedures necessary to track and bill the fees that it is authorized to collect. Additionally, we recommend that the Department submit the revised fee ordinance to Metro Council for the Council's consideration at the earliest opportunity. The effect of this recommendation would be to increase the fees received by the City by approximately \$106,000, or more, per year and establish a better accounting of permits for inspection; the potential negative effect will be assuring that firms and individuals in fact obtain permits.

This change will require substantial coordination with Metro Information Technology in order to integrate the permit into Metro's electronic permitting systems. As Metro considers development of a one-stop permitting system, it would be appropriate to incorporate this permit into the more comprehensive approach.

6. ADMINISTRATIVE STAFF SERVICES OF THE DEPARTMENT DO NOT APPEAR TO BE WELL ORGANIZED.

There are two elements to this issue. The first is the physical organization of the Staff Services unit, and the other is whether the staffing is appropriate for the work load. Together, these elements provide an appearance that the staff support operations of the Public Works Department operate ineffectively. The MAXIMUS project team's impression of staff services is that the unit works diligently to accomplish its mission and that, based on our review of

various work activities, appears to work well within the legal constraints established for the Department's financial performance.

Nonetheless, there are several dynamics which, when improved, could result in a more effective support unit. Relevant observations include:

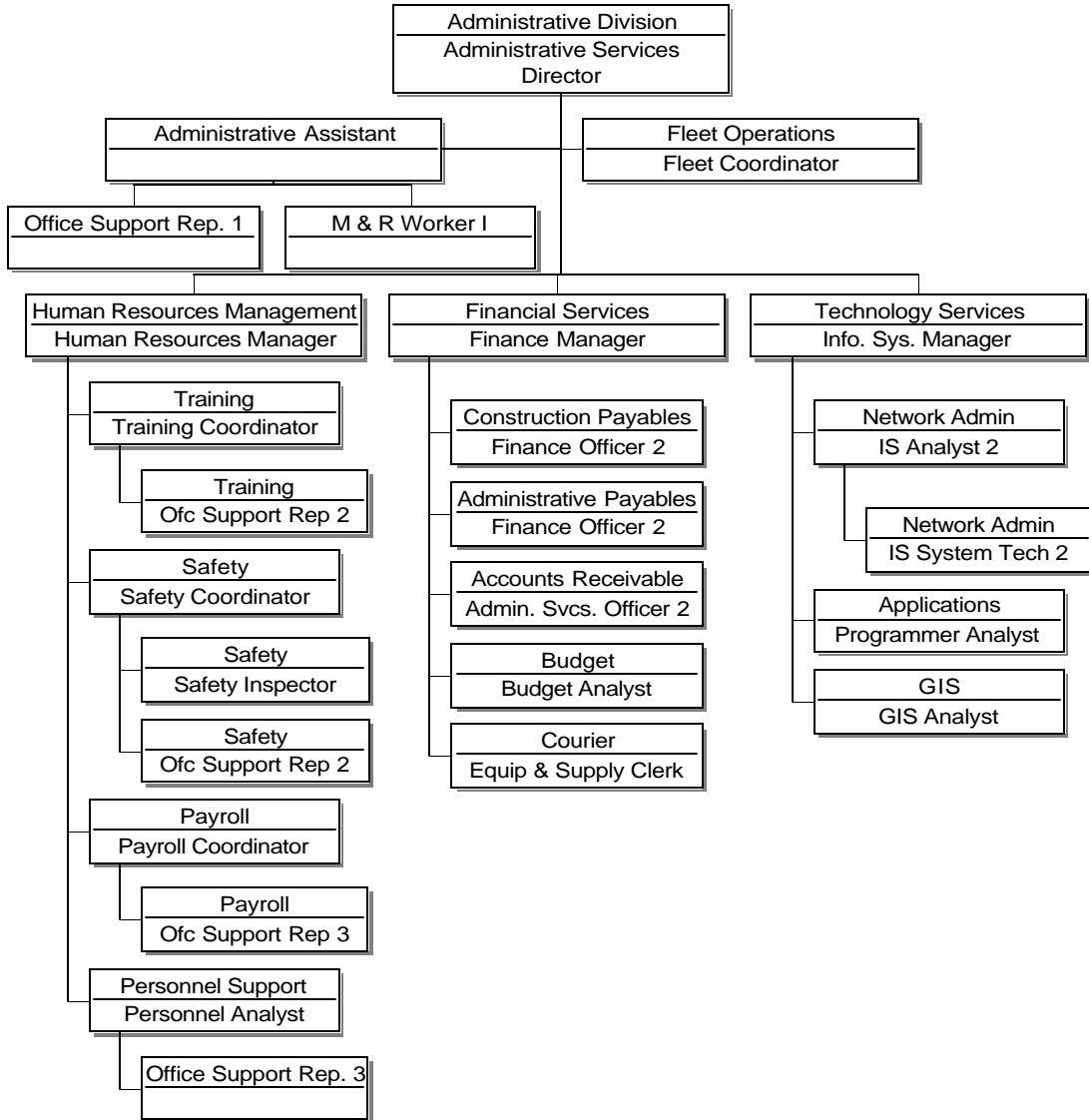
- With the retirement in the past several years of two key staff, there is no middle management within the financial side of the staff services unit. Interviews indicate that most finance staff perceive themselves as reporting directly or indirectly to one individual.
- It is uncertain how the human resources function fits into the overall staff services unit; in some cases, interviews with human resources staff indicate that these individuals perform some financial functions periodically.
- Interview indicate that the staff services unit may have more finance staff than are necessary based on industry standards; this determination is complicated by having five different staff performing the same, or similar, financial functions, despite having four different job titles.
 - Financial management functions are performed in three different divisions of the Department. In addition to the Staff Services Division, financial management is performed by a Finance Officer 2 in the Parking Division and the Waste Management Division has established a financial staff capacity, displacing an existing Administrative Services Officer 2. The displaced position appears currently to be spending time training the new staff and performing miscellaneous projects.
 - In the past year, the Department processed approximately 6,500 account payable transactions, based on a transaction list provided through FASTNET. This includes both administrative payments as well as construction contract payments. Industry standards of performance indicate that this number of transactions is at the low end of work output expectations for a single financial accounting staff person, where between 7,000 and 9,000 transactions per person is typical.
 - While conducting interviews and field data collection the project staff observed the work of the financial and clerical staff of the Department. Our review of their work indicated a large amount of repetitive processing, such as entering invoicing information into their own data sheets, then repeating the entry into City financial systems, then repeating the process upon receipt of payment. There did not appear to be any other significant work activity.

- While on paper, the duties of the finance staff appear to be distributed, interviews with the staff indicated overlap in their perceptions of their areas of responsibility. Additionally, while the open order list ostensibly assigns responsibilities for each contract to a given finance staff member, during our contract review, project staff was frequently directed to a different person.
- The potential for confusion in responsibilities is demonstrated by the MAXIMUS project team's experience when conducting the contract audit. While a master spread sheet assigned responsibilities for contract administration to various staff, in practice, the assigned individual and the person actually knowledgeable of the contract varied.
- A key finance staff person works on a part-time basis; in her absence, information gathering relating to projects for which she is responsible is not possible.
- The current job title of Contract Manager appears to be inadequately described. Interviews indicate that very little of the work of this position relates directly to contract management. Instead, the work is primarily related to legislative policy and general administrative policy interpretation.

Recommendation 5-8. Based on our review of the operations of the Finance functions of the Department of Public Works, the MAXIMUS project team recommends that the Department reorganize and realign its administrative staff. Including wages and fringe benefits, we estimate that these changes will cost approximately \$170,000. The benefit for this is improved coordination of administrative services, coordination of fleet use, enhanced management of departmental payroll, improved personnel services, and the capability to meet the information technology needs described throughout this report and summarized in this chapter.

We recommend that the administrative unit be composed as shown in the following organization chart:

RECOMMENDED ORGANIZATION ADMINISTRATIVE DIVISION



The following table is a matrix of positions that compare the assignment of job positions within the Administrative Division as they currently exist against the proposed changes described in this chapter.

Administrative Division Matrix of Personnel Assignments			
Function	Current	Proposed	Comments
Division Administration		Admin Services Director Admin. Asst Office Support Rep. 1 M&R Worker I	New Position Assigned from Human Resources unit Assigned from Human Resources Assigned from Human Resources
Human Resources: Admin	Human Resources Manager Admin. Assistant M & R Worker I Office Support Rep I Equipment & Supply Clerk II	Fleet Coordinator Human Resources Manager Office Support Rep. 3	New Position Admin Asst would be reassigned to Division Administration; the OSR would be reassigned from Finance Assigned to Division Administration Assigned to Division Administration Assigned to Finance
Human Resources: Center Support	Office Support Mgr (3 positions) Office Support Rep II (3 positions)		Assigned to Streets and Roads Div. Assigned to Streets and Roads Div.
Human Resources: Training	Training Coordinator Office Support Rep 2	Training Coordinator Office Support Rep 2	
Human Resources: Safety	Safety Coordinator Safety Inspector Office Support Rep 2	Safety Coordinator Safety Inspector Office Support Rep 2	
Human Resources: Payroll		Payroll Coordinator Office Support Rep 3	New position Assigned from Finance unit
Human Resources: Personnel		Personnel Analyst	New position
Financial Services	Finance Manager Finance Officer 2 (Part Time) Administrative Assistant Administrative Services Officer 2	Finance Manager Finance Officer 2: Construction Finance Officer 2: Administrative Finance Officer 2: Receivables	

Administrative Division Matrix of Personnel Assignments			
Function	Current	Proposed	Comments
Financial Services (continued)	Finance Officer 2 (in Parking Div.) Office Support Representative 3 (2 positions) Finance Officer 2 Office Support Rep 3 (in Waste Mgmt)	Budget Analyst Equipment & Supply Clerk	This position would displace the part time position. Positions reassigned to Human Resource for Admin and Payroll Assigned from Human Resources
Technology Services	IS Analyst 2 IS System Tech 2 Programmer Analyst (in Waste Mgmt) GIS Analyst (in Engineering)	Information Systems Manager IS Analyst 2 IS System Tech 2 Programmer Analyst GIS Analyst	New Position Transfer from Waste Mgmt Transfer from Engineering
Total Positions			
	Current	23.5	
	In Division	4.0	
	In Other Divisions	27.5	
	Subtotal		
	Proposed		
	In Division	25.0	
	Transferred	6.0	
	Subtotal	31.0	
	Net New Positions	3.5	

Points relevant to this recommended organization include the following

- The organization adds five new positions: Division Director, Fleet Coordinator, Payroll Coordinator, Personnel Analyst, and Information Systems Manager. It deletes one and a half positions: Finance Officer 2 (part time) and Office Support Representative 3 (a currently vacant position in the Waste Management Division, with the functions being transferred to the Administrative Division)
- The Human Resources Unit would be reconstituted by the assignment of the Office Managers and support staff to the Streets and Roads Centers, where they would continue to be responsible for payroll functions. The unit would incorporate a payroll coordinator and support staff for payroll functions for other

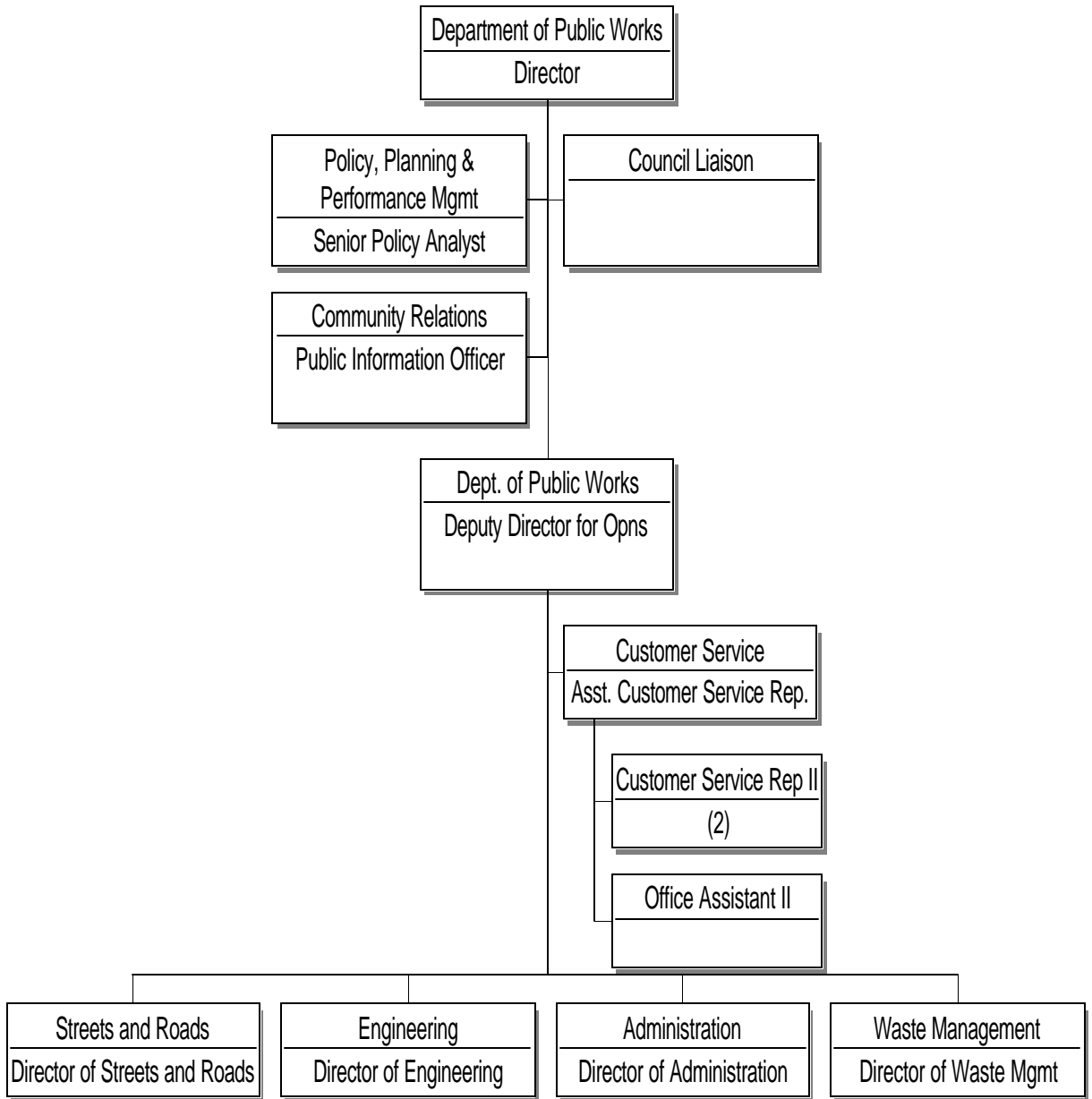
divisions of the Department and for general oversight of Public Works payroll. The unit would also include a new personnel analyst who would assist Departmental employees in general personnel matters. Administrative duties not relating to human resources—receptionist, grounds services, and courier and light maintenance—would be assigned to the Division Administration.

- The redesigned finance unit would have staffing assigned for capital projects financial management, general accounts payable, and general accounts receivable. It would also include a budget analyst for general departmental financial management.
- This structure is based on a consolidation of administrative functions within the Department. Among these are:
 - Transfer of the finance staff from the Waste Management Division to the finance unit.
 - Transfer of the finance staff from the Parking Division to the finance unit.
 - Transfer of the information technology staff from the Waste Management Division to the information technology unit.
 - Transfer of the GIS staff from the Engineering Division to the information technology unit.
- The information technology unit is significantly expanded with one new position and transfers from other Divisions. The new position is a technology manager, who will be responsible for developing and implementing a Department wide strategic information systems plan. This would include upgrading of current systems, replacement of local legacy systems with state-of-the art systems for project management, work management, integrated financial management, and integrated customer service systems. Transferred positions include a programmer analyst position in Waste Management and a GIS analyst position in Engineering. This transfer would provide for a broader range of information technology support throughout the Department and a more effective and efficient use of staff time.

Recommendation 5-9. Based on our review of the recommendations throughout this report, we further recommend that the Department establish the organization shown on the following chart. The estimated cost of this reorganization is the addition of the Deputy Director position, at an estimated \$85,000, including wages and fringe benefits. This organization will result in improved spans of control, better assignment of duties and responsibilities, and a more effective department.

This administrative reorganization is the last piece of an overall reorganization of the Department of Public Works. In total, the recommended Department organization is shown in the following chart:

**RECOMMENDED ORGANIZATION
 DEPARTMENT OF PUBLIC WORKS**



Points relevant to this recommended organization include the following

- The key point of the reorganization is the establishment of a Deputy Director position, who would have daily operational oversight responsibility. The Deputy's span of control would be other operational units of the Department. This will enable the Director to provide policy and public leadership, as reflected by having policy development, council liaison, and community relations reporting directly to the Director
- The Policy development capacity of the Department would include the present Council Liaison Position, and a Senior Policy Analyst position assigned leadership for departmental policy development, strategic planning, and performance management. This later position would be a reclassification of the existing Contract Manager job.
 - The liaison position was established by the Department during the course of this study for the purpose of improving the flow of information between the Department and the policy officials of the City. While we believe that the improved operating procedures and systems will eventually provide those officials with direct, timely access to information, this position will serve an important communications role into the foreseeable future.
 - As discussed in the Engineering Chapter, the duties relating to the current contract manager can be carried out by the expanded Contract Management unit within the Engineering Department. The remaining duties, that of legislative review and policy review and development, should be assigned to the position of Senior Policy Analyst. The duties of the position would include evaluation of Departmental policies and procedures, developing such policies where necessary, and monitoring execution of those policies. This position would also be the individual responsible for working with operating divisions to establish regular performance measures, collecting and evaluating performance data, and preparing an annual performance report. The policy position should also be the lead staff in coordinating departmental strategic planning, discussed later in this chapter. An additional role of this position should also be grants research and support.
- During the period of this study, the Department transferred the customer service unit in the Streets and Roads Division to the Office of the Public Works Director. Since that unit serves primarily for the intake of customer calls relating to work conditions or work requests, we recommend that the unit be assigned to the Deputy Department Director, who will have operational oversight of the Department.

7. INFORMATION TECHNOLOGY WITHIN THE DEPARTMENT IS HIGHLY FRAGMENTED.

Technology support within the Department is vested in two staff persons who report to the Finance Manager. These individuals are responsible for maintaining the Department's hardware and network administrators, maintaining system security, and equipment load-ups and maintenance. The staff do not provide software support; any application software support that is necessary is provided by Metro Information Technology Staff.

Our observations of the Department's information technology capacity include the following:

- Principal applications—Financial Management, Employee Time Tracking, Work Order Tracking, Grant Reporting, Traffic Databases and the Traffic Control System, and Permit Tracking—are mainframe applications operated by Metro I.S.; the Department does not have internal support for these, and several other, mainframe applications
- Most information systems in daily use are generated either by individual users or through some I.S. support for application development using such suites as Word, Access, and Excel.
- In several cases, individual staff have developed their own data applications to perform work, resulting in several staff performing the same work but not being able to exchange information. For example, each finance staff position has developed its own spreadsheet for tracking accounts payable. Individual inspectors have set up their own sheets to track their inspections. Numerous departmental reports that should have been available through the financial management system appear to have been downloaded then reformatted in a separate data record.
- In the Engineering Chapter of this report, we identified the need for the information technology staff to assume responsibility for support of various engineering systems. Because the current staff are oriented most toward hardware maintenance, the expansion into this role will require some retooling or the addition of an applications support staff person.

The Interim Director has appointed a departmental committee to develop a plan for the coordination of information technology systems and support. The MAXIMUS project team

believes that this committee is an important starting point in conducting a detailed inventory of the Department's hardware and software systems. However, decisions regarding priorities needs to be retained at a higher organizational level.

Recommendation 5-10. The Public Works Department should develop its own internal long range systems plan, working in cooperation with the Metro Information Systems Department and the Office of Management and Budget systems. While there is no cost associated with the plan if prepared internally and with the support of Metro IT, external assistance would cost between \$50,000 and \$75,000. The cost of implementation is based entirely on the elements ultimately included in the plan.

In developing a system plan, the MAXIMUS team suggests that the Department consider an order of priority for the following needed systems recommended throughout this report:

- Project management.
- Contract management.
- Integration of billing and receiving functions with the City's financial management system.
- Enhancement of the road management system, with the potential inclusion of sidewalk management.
- Improved customer call systems, including the potential for integration with the City's evolving central call center.
- Enhancement of the parking system.

8. SECURITY OF THE INFORMATION TECHNOLOGY WORK AREA OF THE DEPARTMENT NEEDS TO BE IMPROVED.

The Department's network servers and telephone links are maintained in a suite of two rooms in the Department's main offices at 750 S. Fifth Street. During our meetings in that building, MAXIMUS staff observed that those rooms are frequently left unsecured, with no individual present to make certain that an unauthorized individual did not have access to the

systems. In fact, the doors to the rooms have been removed so that there is no barrier to access at any time that someone might have access to the building.

Recommendation 5-11. The Department should immediately replace the access doors to the work area, installing, at a minimum, four hour fire doors with secure locks. Access to the area should be strictly limited by the Director of the Department and the Director of Administration. The cost of these doors is estimated at \$1,000.

9. THE DEPARTMENT LACKS A CONSISTENT SET OF POLICIES AND PROCEDURES.

The Department has developed a series of operating practices over time; however, project staff has been unable to locate any codified standard of policies and procedures that govern the general operations of the Department. In some cases, individual divisions have developed such policies and procedures, but that has been left largely to those work units. The absence of standard policies and procedures leaves the Department open for public complaints of differential response and treatment.

Recommendation 5-12. The Department has recently begun an effort to document and update its policies and procedures. We strongly recommend that this continue and be given a high work priority. We do not expect any cost implications to this recommendation.

10. THE DEPARTMENT NEEDS TO FOCUS ITS ATTENTION ON PROVIDING CUSTOMER SERVICE.

Throughout this report, we have discussed a number of issues that relate to the customer service elements of the Department. There is a general perception within the Department, the City, and the public that the Department cannot address work status reporting and other inquiries adequately. It is our impression that, while we have documented many areas where work performance needs to be improved, much of the public perception of the Department's

capability relates to how it approaches customer service. Relevant points that we observed, many of which are reported elsewhere in this document, include:

- The Department's call center is located in the Streets and Roads Division and is focused primarily on work performed within that Division. We observed the performance of the call takers and believe that they are performing well; however, we also observed that they are not fully informed of Departmental activities and may be unable to provide full information.
- The Department's work order system does not provide for feedback to any caller; therefore, callers do not receive any reporting on what has happened to their request.
- The lack of a project tracking system, and particularly the lack of integration of field and contract data, prevent the Department from being able to respond in a timely fashion to calls for information from public officials and other departments.
- Public information from the Department appears to be reactive, rather than proactive. As a result, the Department is missing opportunities to present its activities in a more favorable light.

Recommendation 5-13. Customer service needs to be a high priority of the Department. It needs to consider all of its actions in terms of how those actions will improve its ability to provide better customer service. This is a summary recommendation that encapsulates many of the recommendations included throughout this report. An internal call system should be part of the Department's work order system, discussed in the Streets and Roads chapter. One immediate step that the Department may wish to consider is how it might be able to integrate with the Customer Service Center that Metro is creating, in order to develop procedures for coordinated call taking, work ordering, and customer reporting.

11. THE DEPARTMENT SHOULD EXPAND ITS STRATEGIC PLANNING.

The Public Works Department needs to enhance its goals, objectives, and performance measures. At present, the Department appears to function in an almost totally reactive manner. By establishing a long range strategy, accompanied by annual performance goals, the Department can become a more strategic organization, based on the anticipation and solution of

problems. This improves work performance, minimizes the need for reactivity and creates a more professional image of departmental operations.

Recommendation 5-14. The Public Works Department should develop a department-wide strategic plan to identify and accomplish quantifiable and measurable goals and objectives. This should be done internally. While there is no direct cost associated with an internal planning effort, the benefits will be that the Department can establish specific targets for accomplishment and then track and report them. Organizations which focus their attention on goal achievement are generally successful through improved efficiencies and service effectiveness.

In the development of these enhanced goals and objectives, the division should utilize the following guidelines:

- The Department's goals should be consistent with the overall goals of Metro Nashville.
- The goals should focus on the desired results or outcomes.
- Each Division and section within the Department should have specific goals and objectives. The goals should relate to customer service and standards of performance
- The objectives should be specific, measurable results to be achieved by a specific point in time, often are changed from fiscal year to fiscal year (as the previous years objectives are achieved), and stem directly from the goals.
- The Department will need a plan for installing its goals and objectives including the development and provision of training sessions, development of guidelines and examples, and the development of standard formats for the development of these goals and objectives.
- The overall Department goals should be developed with input from all levels of the organization.
- Each section head and his or her supervisory team should start by developing objectives for their section using standard guidelines and format that fully reflect the major responsibilities of each section (what is the job to be done) and how well the job is to be done (the results to be expected in completing the job). Section employees should be involved in developing these objectives.
- Each section should have no more than four or five objectives, but there should be objectives for each program within a section (i.e., design, construction inspection, survey, etc.).

- The Director of Public Works and the Director's management team should, in a coaching session with each Division leader, review the goals and objectives for each division and critique them in terms of their compatibility with the overall goals of Metro Nashville, whether they "stretch" the section in terms of performance and outcomes, whether the objectives are realistic and specific, and whether the objective is measurable. Similarly, each Division leader should use his or her management team to review section goals.
- The Divisions and sections should then revise the goals and objectives as necessary.
- Once adopted, the Director of Public Works and the Director's management team should check quarterly progress in achieving these objectives to identify the progress made in their achievement and problems, and provide advice on corrective action.
- The objectives should be revised every fiscal year as part of the Department's budget planning process.

The development of goals and objectives using this methodology for strategic planning would provide a clear basis for what results are expected in what time frame.

12. THE DEPARTMENT SHOULD WORK WITH FACILITIES MANAGEMENT TO CONDUCT A FULL ANALYSIS OF ITS PHYSICAL PLANT NEEDS, PARTICULARLY AT THE SOUTH FIFTH STREET COMPLEX.

During the course of the project, MAXIMUS staff had the opportunity to work in, and observe, all of the buildings that comprise the Department's facilities. We also included in our interviews, questions relating to the impact of the current facilities on work performance. Our observations regarding the South Fifth Street work center include the following:

- Any systematic maintenance on the air handling systems was not apparent; return air vents appeared to be dirt encrusted.
- Office areas were cramped and filing of materials appeared to be random due to the lack of proximate filing space. One notable problem was that personnel files were retained in an open work area where anyone with access to the area had unlimited access to those files.

- There was insufficient meeting space for work sessions, planning meetings, and client services.

- Several of the sites did not appear to comply with state and federal standards relating to handicapped access for employees. One particularly notable point was the narrow stairway which was the only access for Parking Enforcement personnel to their common area.

- The Departmental administrative office was organized in such a fashion that there was no logical flow of traffic movement or common work areas for persons with similar responsibilities.

Recommendation 5-13. At the earliest opportunity, the Public Works Department and Metro Facilities Management should review the Department's South Fifth Street work complex and develop an intermediate range plan to resolve existing problems and to provide a better work environment for departmental personnel. There should be no cost for conducting the analysis, unless Metro decides to use an external review firm, the cost for which would be estimated at \$75,000. Costs of implementation will depend upon the overall facilities improvement plan. The focus of the study should be on establishing a work environment that meets state and federal standards and is conducive to effective and efficient work performance by departmental personnel.

In the final chapter, following, we summarize the recommendations that are included within this report and provide a recommended implementation plan and timetable.

VI. CONCLUSIONS

In this chapter, we summarize the recommendations and cost impacts which we have made throughout the report, provide suggestions regarding the relative priorities of the recommendations, and identify any implementation issues which the City will need to address. In preparing these recommendations, we have classified them as being high, medium, or low priority. High priority recommendations are those which have significant cost (particularly cost savings) impacts, are perceived as critical to the mission of the Department of Public Works, or which are first steps involved in the implementation of other recommendations. Medium priority have lower cost implications, are not as mission critical, and whose implementation time frame can extend six months or more. Low priority recommendations are those which would improve Departmental operations but are not mission critical or whose implementation is not time sensitive.

This chapter consists of two tables. The first is a summary of recommendations. This table assembles all of the recommendations developed in this report, identifies the fiscal impact and projected benefits, assigns a recommendation priority, and identifies any key implementation issues. The second report is a cost breakout. It includes only those recommendations which have an estimated cost, cost savings, or revenue enhancement associated with the respective recommendation.

The following table is the summary of recommendations

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
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CHAPTER II: STREETS AND ROADS**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-1	The project team recommends that the Traffic Control Section significantly increase staff in order to initiate, and continue to provide on an on-going basis, a preventive maintenance program which will allow the Section to proactively maintain Metro's 800 signalized intersections, as well as to maintain records regarding system reliability.	<p>An estimate of the cost to minimally staff the Signal Maintenance and Construction Units is approximately \$405,500. Of this amount, an estimated \$76,500 would be increases in supplies and materials, and \$329,000 would be in personnel costs. New trucks will cost approximately \$300,000.</p> <p>Est. benefit: Preventively maintaining traffic signals increases system reliability and minimizes costs associated with emergency repairs, both in terms of direct materials and contractual costs as well as in the disruption of staff's scheduled work. Although the direct cost of increased reliability of signalized intersections cannot be quantified, in terms of decreased liability and motorist inconvenience, the elimination of unscheduled emergency repairs may provide cost savings.</p>	Medium	<p>As the Traffic Section does not currently possess the positions in its budget, these must be requested and approved in the upcoming budget.</p> <p>Although the direct quantifiable benefits are insignificant compared to the direct costs, there are important liability issues. As the report indicates, there were no signals which were preventively "re-lamped" in 2001, indicating that there is a possibility that signals may fail at critical times. Further, motorist inconvenience is high during these times, and should be minimized as a matter of public policy.</p>

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Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
2-2	The capability to track signal operations and reasons for system failure should be incorporated into Metro’s proposed Intelligent Transportation System data collection and reporting.	<p>There should be no additional cost associated with this recommendation through incorporation into the grant-funded ITS. This information should also link to a job work order management system.</p> <p>The benefit of this information is that it will permit Department management to monitor signal activity on a regular basis, track outages, and prepare work plans to address systematic problems.</p>	Medium	There are no significant implementation issues.
2-3	Allow the Traffic Control Section to submit a “bid” for the installation of traffic signals as a measure to create a more competitive environment for this service.	Typically, this approach to competition has the result of reducing costs for the same level of service by approximately ten to fifteen percent. Based only on existing, open purchase orders with the current service provider, we estimate that this approach would yield savings of about \$54,000 per year.	Medium	This will require the Department to think like a private enterprise and assemble a work plan and staffing plan that can be competitive. There are some inherent bid requirements that cannot be overcome—such as bid bonds and performance bonds—but the competitive pricing evaluation can be adjusted to account for some private sector costs that the Department would not incur.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
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	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-4	The project team recommends an increase of four M&R Workers in this Unit to accomplish routine sign maintenance and repair, inventory collection and maintenance, and proactive determinations of those signs in need of repair.	<p>The estimated cost of this recommendation is approximately \$204,059 in operating costs for personnel and materials; of this amount, \$124,059 would be for additional personnel, and \$80,000 for supplies and materials. In addition to the operating costs, there would be an estimated capital cost of \$125,000 for additional vehicles.</p> <p>Est. benefit: Non-quantifiable benefits include the reduction of liability due to poor sign visibility and/or absence of proper signage. The directly quantifiable benefits include the reduction in the numbers of incidents for which current staff members are required to replace signs on an emergency, or unscheduled, basis.</p>	Medium	<p>Again, the positions are not currently in the Unit's budget, and must be requested in the next fiscal year.</p> <p>Metro faces a potential liability issue through the non-replacement of signs which have faded significantly (average duration for signs is currently about 22 years – significantly above recommended levels), however the greater issue here is the lack of staff to proactively determine locations in which signs have been vandalized or removed.</p>
2-5	The project team recommends that the Department develop an automated inventory of signs maintenance. At a minimum, this could be an internally developed Access database; however, more ideally, this should be part of a master work order and control system.	<p>This recommendation has no cost implications.</p> <p>The benefits of this recommendation are improved management of work and inventory, resulting in a more efficient use of personnel and a more effective sign maintenance program.</p>	Medium	This should be incorporated into the job work order system.

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	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-6	The project team recommends combining the two currently separate disciplines of signal construction and signal maintenance.	<p>The consolidation of these two functions will allow the reduction of one of the Supervisor positions with an estimated cost saving of approximately \$57,800 annually in salary and benefits.</p> <p>Est. benefit: Greater flexibility of management in the deployment of personnel resources, particularly at lower-skilled levels. The consolidation allows the reduction of one managerial position, saving approximately \$57,800 annually.</p>	Medium	Although the costs of additional personnel recommended for these two sections far exceeds the quantifiable benefits, the reduction of one supervisory position somewhat abates this cost, but more importantly, it allows greater flexibility of a single manager to deploy resources. This will become important in the deployment of limited staff in instituting a comprehensive PM program.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER II: STREETS AND ROADS			
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
<p>2-7</p> <p>Given the variance in the cost figures for milling, the project team does not, at this time, make a recommendation regarding the retention or outsourcing of the function. Rather, it is recommended that the Division begin capturing and analyzing data over the next 12 months to establish a basis for comparison to private providers, and to determine if there are certain characteristics of the in-house operation which make it either more cost-effective than private providers, or if there are characteristics of certain jobs which make obtaining bids from private contractors difficult or impossible.</p> <p>If data analysis indicates that this function is not cost-effective, the Division would be recommended to re-deploy approximately 8.1 FTE's in other areas. Given that the employees currently in the milling crew perform other functions throughout the year, this would allow the Division to enhance services in other areas, such as in concrete replacement and inspection. If the cost analysis holds after the collection of valid data, it would appear that the milling operation is effective, when compared to private contractors.</p>	<p>Est. cost: None at this time. Cost accumulation can be accomplished to a far greater degree, even without the purchase and implementation of an automated work management system.</p> <p>Est. benefit: When combined with recommendations regarding a slurry seal program for street maintenance, the Department has the opportunity to reduce substantially the costs of street maintenance.</p>	<p>High</p>	<p>Given the magnitude of the potential cost savings when combined with the design and implementation of a slurry program, this is a critical priority.</p> <p>An attractive feature of this particular issue is the ease with which it can be investigated and verified. This requires, first, a greater level of attention to detail regarding the accuracy of reported metrics, and secondly, a systematic and periodic analysis of the monthly costs associated with this function (as well as others).</p>

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Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
<p>2-8 On a strict cost-effectiveness basis, the project team does not recommend the elimination of the paving function at this time. However, the project team recommends that the Department greatly expand its slurry seal program as a preventive maintenance measure. This recommendation will result in a proportional reduction in the requirement to overlay streets, as is currently done. Given that the full implementation of the slurry seal program will take between 12 and 24 months, the project team recommends the retention of the paving function for that duration of time. At that time, it is recommended that the Streets and Roads Division re-evaluate the cost-effectiveness and productivity of the paving crew.</p>	<p>Est. cost: None at present.</p> <p>Est. benefit: Again, costs obtained through the current work management system indicate a very large variance from month to month, although the highest-cost month on the team's analysis indicated an in-house cost that is between 28% and 35% greater than that available in the private sector.</p>	<p>Medium</p>	<p>The need for flexibility in meeting the expanded paving needs in Metro lowers the priority of this recommendation somewhat, however the project team still strongly recommends correcting the fundamental problems of the lack of reliable workload data as soon as possible. This recommendation may be easily implemented through use of existing automation resources and a greater degree of focus upon the accuracy of data submitted from the field.</p>
<p>2-9 Through a simple reallocation of areas of responsibility, the Division can attain rough parity in the workload distribution between East and West Centers.</p>	<p>Est. cost: None</p> <p>Est. benefit: The decreased travel time for West Center crews, combined with increased productivity of East Center crews suggest that a greater level of service will result from the realignment.</p>	<p>Medium</p>	<p>Immediately begin the transfer of AIM work orders emanating from the 12th and 13th Districts from the West Center to the East Center.</p>

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	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-10	The Division should begin the process of determining optimum crew sizes for each of the functions performed at the Centers, as well as at the satellite locations.	<p>There is no cost associated with this recommendation.</p> <p>We would expect that the benefit of this recommendation would be a greatly enhanced level of productivity both in ditch cleaning and other crew based work such as street maintenance and repair, signs and signals, tree crews, and the like, resulting in greater cost efficiency.</p>	Medium	The implementation of this recommendation will require the Division to allocate time and effort to more than a surface level of analysis. Specifically, although an automated work management system will generate cost data and productivity of labor for certain tasks, it will require a higher level of analysis to perform comparative analyses for various crew sizes to determine the optimum sizes for each tasks. The project team provides a methodology for this type of analysis in the report for ditch maintenance crews. This methodology should be extended to other functions in the Division as well. Although an automated work management system will facilitate this effort, as the report shows, it is not a critical component.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
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	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-11	The project team recommends the development of an annual work plan which will not only guide the Division in prioritizing and performing specific tasks, but will provide Department and Metro management with a document with which to hold the Division accountable for results. This plan should be coordinated with, and signed off by, the Engineering Division to assure coordination of maintenance and improvement projects.	<p>Est. cost: Increased time spent by Managers, Superintendents and Supervisors in the definition of targeted service levels, locations of work, availability of staff, and analysis of costs associated both with in-house labor efforts and those of private contractors.</p> <p>Est. Benefit: Greater level of accurate reporting for cost comparison purposes, as well as for the reporting of activity to Department management, Mayor and Metro Council. Greater ability to project resource limitations, “bottlenecks” and excess capacity.</p>	High	<p>Begin the process of accumulating sufficient workload data to make determinations of productivity levels. This should be followed by the definition of appropriate service levels given the restrictions of available personnel and equipment resources, and a plan for the accomplishment of targeted work.</p> <p>The accomplishment of an annual plan involves a great deal more than simply documenting productivity and calculating what is possible based on the available resources. This annual plan should be seen as a process whereby the concerns of managers of the Division, Department and Metro are incorporated. This will require a series of planned meetings and consultations with various stakeholders and interest groups to best match the Division’s resources to those required by the community.</p>

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CHAPTER II: STREETS AND ROADS**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-12	<p>The project team recommends that the Division discontinue input into the CostSum program and obtain a suitable job work order system which will facilitate the accumulation of pertinent data, as well as summarize this data for use in the annual planning process outlined above.</p>	<p>The costs for such systems vary greatly depending upon desired elements. If the Department is able to expand an existing license agreement with another Metro Department with a suitable information system, the cost could be as little as \$25,000 to \$50,000. However, if the existing systems in other departments are unsuitable for use in Public Works, the cost could be as great as \$350,000 to \$500,000 for a new system.</p> <p>Est. benefit: Greater accountability of managers of the Division, as well as a greater degree of accuracy and reliability of workload and activity reporting.</p>	High	<p>Although the implementation of this recommendation may be accomplished without the purchase of additional automated resources, as a practical matter, the size of Metro Nashville and the volume the workloads of the Division require either the purchase of a new work management system or the procurement of an expanded license agreement for the use of an existing one within another Metro Department.</p> <p>Given that several Metro departments require strong work order systems, it would be appropriate to conduct the expansion of an existing system or the acquisition of a new system in conjunction with those departments and Metro's information technology staff.</p>
2-13	<p>The project team makes the following recommendations to improve inventory management:</p> <ul style="list-style-type: none"> • Warehouse personnel should make weekly "spot checks" of inventory items which have been issued to Department personnel on longer-term bases. If items are found to be missing, these occurrences should be documented and the Division Assistant Director should be notified. Additionally, procedures should be established to penalize employees to whom the items were issued. 	<p>Est. cost: None other than additional time taken in identification of randomly-selected items for "spot check" and travel to sites. The costs for an improved inventory tracking system are included in the recommendation for a new job work order system.</p> <p>Est. benefit: Greater level of accountability could result in lower shrinkage rates, although the current rate is unknown at this time.</p>	Medium	<p>The Warehouse has instituted routine bi-weekly cycle counts, however, this has apparently not resulted in hoped-for results, as the project team found a low correlation of automated records and the items physically found in the inventory.</p> <p>The personnel at the Warehouse will be required to supplement these efforts with a systematic, weekly spot check of items issued on longer-term bases, and a sharing of the results, along with explanations for variances, of the bi-weekly cycle counts with the Department administration and</p>

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Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
<ul style="list-style-type: none"> • The results of the bi-weekly cycle counts should be issued to the Department’s Business Manager, as well as to the Assistant Director of the Division of Streets and Roads. Explanations for any discrepancy should accompany the bi-weekly report. • Procedures should be established in the Warehouse which will decrease the rate of discrepancy from current unacceptably high levels to no more than 3% at a single point in time. • The Department should also modernize its inventory software system, which is currently an older, limited capacity system. Since inventory items track primarily to the Department’s streets and roads operations, it would be appropriate to incorporate the inventory management into the recommended job work order system previously discussed. The costs for this would be included in the cost of the work order system. 			<p>Streets and Roads management.</p> <p>The need for an integrated inventory system should be included in the overall recommendations for a new job work ordering system; as with the recommendation for that system, this should be considered from the perspective of a Metro-wide initiative.</p>

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CHAPTER II: STREETS AND ROADS**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-14	The project team recommends that the current policy be revised to establish the Department of Public Works as the sole agency responsible for repairing all roadway damages, regardless of origin or cause. Those individuals or agencies receiving permits for roadway cuts should, at the time of purchasing the permit, pay a fee sufficient for Public Works to repair the cut. This variable fee should be assessed based on the proposed magnitude of damage. Once the cut is repaired, Technical Service should be notified, with that Unit making the appropriate revision in the pavement management system.	Est. cost: None Est. benefit: Although data do not exist to calculate the amount of cost dedicated to the repair of roadway cuts, Metro will almost certainly recover a substantial amount through the imposition of a fee for recovery of the direct costs expended by road crews in the repair. This work is not currently recovered.	Medium	Develop an ordinance which outlines a variable fee for roadway repair based on the magnitude of the damage.
2-15	The project team recommends that, once each of the pavement condition ratings is corrected in the system, with sufficient procedures developed and implemented for the retention of backup data, the Department utilize only the pavement condition ratings as the source for identifying street segments for repaving, with the objective being to maximize the overall pavement condition rating of Metro streets. It is recommended that, in absence of compelling reasons to resurface segments greater than 70 (such as to ensure even quality with adjacent segments recently resurfaced, repairing utility cuts, etc.), that the Streets and Roads Division discontinue the resurfacing of streets with pavement ratings which are 115% more than the average rating of all streets recommended for resurfacing.	Est. cost: None Est. benefit: Although the benefits of a purely mechanical method of street segment identification cannot be quantified, the result will be a maximizing of the overall street pavement index for Metro, with the resulting increase in “driveability” of its roadways.	High	Although the pavement management indexing system is currently in effect, and will require no change in procedure from the standpoint of personnel involved in the process, there have been recent problems with the reliance on corrupt data in the system. These data error problems should be corrected prior to use of the system under any scenario.

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Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
2-16	<p>Nashville may wish to consider a more encompassing approach to planning its streets and other public work services by dividing the City according to maintenance districts. The Department should work with other Metro departments to utilize maintenance districts county-wide.</p>	<p>Est. cost: None</p> <p>While there is no cost to this change, it would result in a more effective maintenance program by creating a consistent division of responsibilities, and improved work planning and tracking.</p>	<p>Low</p> <p>This project should be undertaken concurrently with development of Departmental job work order and a contract/project capital management system. Because this has potential to benefit all Metro departments with a field service requirement, it would be appropriate to discuss this option with other departments to develop a Metro-wide approach to maintenance district based service delivery.</p>
2-17	<p>The project team recommends that the Streets and Roads Division consolidate the East and West Centers with the Special Operations Unit. The Division should retain the two satellite locations; however these should be under the direction of a single manager, and utilized as staging points to minimize travel time to work sites. The consolidation of the three currently-separate units into a single organization will allow the reduction of the two M&R District Supervisors, resulting in a total reduction of four management positions.</p>	<p>Est. cost: None</p> <p>Est. benefit: Cost savings of approximately \$104,753 annually through the reduction of management personnel at the two satellite centers.</p>	<p>High</p> <p>No impact on operation, however this change will result in the need for greater emphasis and reliance upon a functioning work management system to receive reports on productivity of Center crews, and the relay of AIM work order data to these Center staff. This should be facilitated by the transfer of the Office Managers from Human Resources to Streets and Roads.</p>

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER III: CHIPPER DIVISION			
Recommendation	Fiscal Impact and Benefit	Priority	Implementation Issues
3-1	<p>The project team recommends that the Division convert its chipper service to a fleet based on combining grappler trucks in tandem with trailers.</p>	<p>Est. cost: None</p> <p>Est. benefit: We estimate that the annual cost savings for this change will be at least \$85,000 per year, assuming the same volume of collection.</p>	<p>High</p> <p>The Department is currently in the process of doing this.</p>
3-2	<p>The project team recommends that the Division alter its service delivery method to provide its chipper service strictly on a scheduled-route basis in order to facilitate the collection of curbside debris.</p>	<p>Est. cost: Citizens may perceive a lack of attention to customer service, however, this may be countered by explaining that customer service is increased for all residents through greater productivity of crews.</p> <p>Est. benefit: Annual savings between \$116,000 and \$232,000. Other benefits include reduction of time lost in driving to locations outside of normal daily routes, lower incidence of customer complaints due to passing by of brush on streets which has not been called in; and, the administrative time expended in tracking brush pick-ups of call in requests will be eliminated.</p>	<p>Medium</p> <p>This recommendation will not impact the daily operation of the Chipper Service other than the removal of the requirement to travel to sites outside the normal daily routes.</p>
3-3	<p>Metro should establish regulations on the preparation of brush for pick-up and rigidly adhere to those standards. This will have no cost requirement, but will result in greater work productivity.</p>	<p>Est cost: None.</p> <p>Est. benefits: This will increase employee productivity in terms of the length of time required to collect brush. It can also be expected to reduce the amount of brush cut and left by commercial firms.</p>	<p>Low</p> <p>Implementation of this recommendation will require considerable public information and the willingness on the part of Metro not to collect brush that does not meet the standard.</p>

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
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CHAPTER IV: ENGINEERING**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
	Recommendations 4-1 through 4-10 constitute a series of recommendations for the improvement of the Capital Projects Management Process.	<p>There are no costs associated with these recommendations since they relate to operating procedures.</p> <p>Based on our experience with other governmental units, the MAXIMUS project team anticipates that the Department will experience a significant improvement in the overall effectiveness of its capital management program. This effectiveness will be observable in improved record keeping, greater timeliness, better cost control and financial management, and a vastly enhanced ability to provide project information to policy officials, other departments, and the public.</p>		
4-1	The responsibilities for Capital Projects management need to be clarified.	None	High	These responsibilities need to be clearly identified as assigned to the Engineer 3 assigned to the Capital Projects Management Section and the Engineer 3 held accountable for their delivery.
4-2	Prepare a summarized twenty-four month bar chart schedule for all of the capital projects that will be designed and inspected by the Capital Projects Section.	None	High	The Engineer 3 is already working on this schedule.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER IV: ENGINEERING				
Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
4-3	Microsoft Project should be more fully utilized for the scheduling of each project.	None	Medium	Training needs to be provided to all of the professional and technical staff of the Capital Projects Management Division in the use of Microsoft Project.
4-4	Prepare a monthly capital project status report.	None	High	The preparation of this monthly capital project status report should occur only after a draft report has been developed, and reviewed and critiqued by all of the important customers
4-5	More complete guidelines should be utilized to document resource requirements for the design and inspection of capital improvement projects.	None	High	The Assistant Director of Public Works – Engineering has discussed these guidelines with MAXIMUS. MAXIMUS will provide a copy of the guidelines it has utilized in the past.
4-6	A design authorization form should be completed before commencement of design.	None	High	The Assistant Director of Public Works – Engineering has discussed the design authorization form with MAXIMUS. MAXIMUS will provide a copy of the design authorization form it has utilized in the past.
4-7	A pre-design meeting should be conducted prior to the commencement of design.	None	Medium	This should be initiated immediately for all new capital projects.
4-8	A design report should be completed when the design is no more than 10% complete.	None	High	The Assistant Director of Public Works – Engineering has discussed the design report with MAXIMUS. MAXIMUS will provide a copy of the design report it has utilized in the past.
4-9	The Capital Project Management Section should utilize a time reporting system to capture the staff costs associated with design and inspection of capital projects.	None	High	The system, and written procedures for data collection, should be discussed with staff and a “pilot” conducted first. MAXIMUS will suggest alternatives to automate this system available at no cost to the Engineering Division.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER IV: ENGINEERING				
Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
4-10	A final report should be prepared upon completion of a capital project.	None	Low	The Assistant Director of Public Works – Engineering has discussed the final report with MAXIMUS. MAXIMUS will provide a copy of the final report it has utilized in the past.
4-11	Engineering Technician 3's assigned to construction inspection should document their inspection work.	None	High	This should be initiated immediately. MAXIMUS will provide a copy of the written procedure it has utilized in the past as a guideline for documentation of work by inspectors.
4-12	The document management procedure should be expanded to include a required table of contents and all documents should be maintained in a binder with all of the binders maintained in a centralized location.	None	High	The Assistant Director of Public Works – Engineering has discussed the document management procedure with MAXIMUS. MAXIMUS will provide a copy of the document management procedure utilized by another client.
4-13	The engineering staff within the Capital Project Management Section should be provided with access to the automated financial system from their desktop personal computer.	None	High	This should be discussed with the Finance Department, and training arranged for the staff requiring access to the system in the use of the automated financial management system
4-14	Metro should develop a contract management system for use by all departments. funds and improved public reporting.	Depending on the approach decided upon, a contract/project management system could cost from an estimated \$250,000 to \$1,000,000. The benefit of such a system would be an effective means of contract/project management, which should translated into a more efficient use of capital	High	This should be pursued as part of a Metro-wide strategy since this system could be applicable to all Metro departments which conduct capital projects.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER IV: ENGINEERING				
Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
4-15	Eight engineering positions should be added to the Public Works Department to carry out the development review and inspections. The added positions are necessary for the Department to carry out its review responsibilities.	The additional appropriation for these positions is estimated at \$400,000 for salaries and benefits.	High	
4-16	The Engineering Division needs to be reorganized in order to allocate work and skill sets to necessary tasks and to provide appropriate organizational priority to the Department's mission.	<p>There is no cost associated with the reorganization itself; however, several of the personnel changes will have some cost implications, and those are presented as they relate to the specific personnel actions in the following detailed recommendations.</p> <p>The MAXIMUS project team believes that this organization will provide for a more effective Engineering Division based on appropriate segmentation of duties and assignment of responsibilities, creation of work units that have specific focus, and the enhancement of a core capital management unit.</p>	High	The realignment of work is necessary if the Department is to be successful in meeting the needs of Metro's expanded public works programs.
	The responsibility for supervising Permits and Records would be assigned to the Engineer 3/Development Services.	None	High	This should be initiated as part of the overall organizational restructuring of the Engineering Division.
	A separate unit should be established within the Traffic Engineering Section with responsibility for Neighborhood Traffic Management.	None	High	The goals, objectives, and performance measures need to be defined for this program, focusing on proactive traffic management measures.
	The responsibility for managing the parking enforcement/structure program should be assigned to the Transportation Manager.	None	High	This should occur after the position is filled.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
	Responsibility for the pavement management program should be assigned to the Engineer 3 responsible for capital project management.	None	High	This should occur immediately. All staff associated with this program should be reallocated from Streets and Roads to Engineering. The responsibility for this program should be assigned to an Engineer 2.
	Responsibility for the pavement management program should be transferred to Engineering.	None	High	This recognizes that pavement management reflects engineering issues and a more comprehensive approach to right of way maintenance.
	Responsibility for the sidewalk management program should be assigned to a Construction Manager who will have lead management and project coordination responsibility.	None	High	This would create an organizational home for the sidewalk program and provide specific leadership responsibility. It will be important that the individual assigned to this duty have excellent public relations skills since much of this job will be public interaction.
	The responsibilities of the Engineer 2 responsible for bridge design should be broadened to include supervision of all staff assigned to the design of capital improvement projects.	None	High	The reallocation of duties need to occur within the context of the definition of the accountabilities for this position, just like the Engineer 3.
	The responsibility for construction inspection of public improvements constructed as a result of development, including storm drainage, should be retained within the Development Services Section.	None	High	This relates to a subsequent recommendation concerning the transfer of employees between Public Works and Water.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER IV: ENGINEERING				
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues	
	The responsibility for inspecting public improvements associated with commercial and industrial building permits (i.e., sidewalks, driveways, curb and gutter, storm drains, etc.) should be reassigned from the Permits Unit to the Development Services Section.	None	High	There is no significant implementation issue.
4-17	Staffing within the Engineering Division should be reallocated, with the addition of one other position, to bolster capital project management and the construction inspection of capital projects.	The upgrades in positions would result in a total increase in expenditures of between \$102,000 and \$120,000 (based on an individual increase of between \$6,000 and \$10,000 per position, plus fringe benefits), and the cost of an additional Engineer I. This is the most cost effective approach. To hire additional staff would obligate the Department to expend an estimated \$350,000 in annual salaries and benefits; the use of consulting engineers could be expected to result in costs ranging between \$1,200,000 and \$1,400,000, based on variable consulting rates.	High	These transfers should occur as soon as possible to create an organizational impetus for the changes in approaches to project planning and management.
	The vacant Engineering Technician 2 position within the Permits Section should be eliminated, and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.	The estimated cost of the upgrade is included in recommendation 4-17.	High	
	An additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.	The estimated cost of the new position is included in recommendation 4-17.	High	

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER IV: ENGINEERING					
Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues	
	The Assistant Public Works Director – Parking position should be eliminated and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.	The estimated cost of the upgrade is included in recommendation 4-17.	High		
	One of the two Engineering Technician 2 positions within the Records Unit should be eliminated and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.	The estimated cost of the upgrade is included in recommendation 4-17.	High		
	The Technical Services Coordinator position within the Capital Project Management Section should be transferred to the Information Technology Unit within Public Works Administration.	Est. cost: None	High		
	A Corrections Officer position within parking enforcement should be eliminated and an additional Engineer 1 position allocated to the Design Unit within the Capital Project Management Section.	The estimated cost of the upgrade is included in recommendation 4-17.	High		
	Two Engineering Technician 3's should be reallocated from Permits to construction inspection within the Capital Projects Management Section.	Est. cost: None	High		
4-18	Metro Nashville should increase the level of traffic engineering staffing by two positions at an estimated annual cost of \$130,000 and reallocate three other positions for neighborhood traffic management.	An increase in costs of \$130,000 annually Cost avoidance of \$110,000 annually	High	An office should be provided to co-locate all of the staff assigned to the Neighborhood Traffic Management Program.	
	The Engineering Technician 2 assigned to Signal Design should be reallocated to the Neighborhood Traffic Management.	Est. cost: None	High		

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER IV: ENGINEERING			
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
	The Engineer 1 assigned to Signal Design should be reallocated to Neighborhood Traffic Management.	Est. cost: None	High
4-19	The Engineering Division needs to enhance the extent of its performance measures.	Est. Cost: None	Medium The management and supervisory team needs to be provided with training in the development of goals, objectives, and performance measures. While the measures should be adopted at the earliest opportunity, during the transition period for the organizational changes, it is not likely that the Department will be able to generate performance data that accurately reflects Division capacity. This will probably occur in the second year.
4-20	The Street Closure/Utility Cut Program should make permit issuance and requirements available on the Internet.	None	Medium This will require the technical assistance of the information technology unit in Public Works Administration.
4-21	The MAXIMUS project team recommends that Metro complete as soon as possible a detailed sidewalk improvement plan before proceeding too extensively into its current initiative.	Est cost: None, since the Department has already entered into contracts for private consulting relative to a sidewalk program, and it is expected that this contract will provide much of this assistance. While there is no direct cost impact per se, a well-developed plan will result in a more effective program, more efficient use of financial resources, and greater customer satisfaction.	High The Department should initiate this effort as soon as possible. In order to maintain current efforts, the Department should identify high priority projects that it should undertake immediately, while completing the larger program planning.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
4-22	Metro Nashville should consider the co-location of the traffic operations center with the proposed dispatch/emergency operations center.	<p>Est. cost: Included within the Intelligent Transportation System grants.</p> <p>It is reasonable to expect that the potential cost savings for co-location could be significant if the technology issues warrant such joint services. Funding for the study should be available through the grant program for the Intelligent Traffic System project.</p>	High	The co-location needs to be evaluated as part of the implementation of the intelligent transportation system and the design of the new dispatch/emergency operations center.
4-23	The Parking Division staffing should be reduced by 2.6 FTE.	<p>Est. cost: None</p> <p>Est. benefits: This transfers the cost to implement other recommendations have called for the use of 1.6 of the positions for upgrades in the Capital Design Section of Engineering and a transfer to Staff Services.</p>	Medium	These changes should occur concurrently with other recommendations.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
4-24	Automation of parking enforcement and data would improve parking operations and provide enhanced management reporting capacity.	<p>An automated system would cost Metro between \$125,000 and \$200,000, depending on the system selected, potential integration with the Court systems, and the purchase of remote technology for both parking enforcement personnel and police personnel.</p> <p>The benefits would be greater employee efficiency in issuing tickets, elimination of manual work load counts, and elimination of manual sorting and processing of tickets. This system will enable the automation necessary to expand ticketing productivity per enforcement officer described in the preceding recommendation. These efficiencies enable the reduction of parking enforcement work force which is also recommended.</p>	High	This should be carried out in conjunction with the Police Department and Courts.
4-25	The Department should consider returning to civilian parking enforcement personnel.	<p>Est. cost: None</p> <p>Est. benefit: This would result in an estimated savings of approximately \$15,000 to \$18,000 per year, based on five positions.</p>	Low	This change should occur on a transitional basis as positions become available.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
4-26	The Engineering Division needs to improve its phone responsiveness to calls from other Departments or from developers.	<p>The only cost impact would be the potential monthly charges for additional phone lines if the Department were to install dedicated phone lines.</p> <p>The benefits would be improved turnaround for inquiries from other departments and external customers.</p>	Medium	These changes can be made during the process of realigning Engineering personnel.
4-27	The Engineering Division should locate an engineer in the offices of the Metro Planning Commission to assist in processing engineering conditions of approval. This is the same approach utilized for the Code Enforcement Department.	<p>Assuming sufficient work space and office equipment at present, there would be no cost associated with this recommendation.</p> <p>The benefit would be improved customer relations and interdepartmental coordination of plan review.</p>	Medium	Metro is considering instituting a one-stop development review office. It would be appropriate to include this function in the planning for that office.
4-28	Specific development guidelines should be developed for traffic engineering requirements that need to be integrated by developers in preliminary plats.	<p>There is no cost associated with this recommendation.</p> <p>It would have the benefit of providing clear guidance to developers and to other departments regarding engineering design requirements for preliminary plats.</p>	Medium	This should be undertaken in coordination with Metro Planning. The design process should be structured so that affected customers have the opportunity to participate in the preparation of the guidelines.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
4-29	The Engineering Division should incorporate the reasons for any non-compliance aspects of the project in its project status reporting. Additionally, the Public Works Department and ADA Compliance Office should develop a protocol on how to resolve problems in engineering design where ADA standards and engineering requirements cause unavoidable incompatibility. This protocol should be reviewed by the Metro Legal Department for compliance with the obligations and intent of the settlement agreement. Once approved, this protocol would serve as the basis for decision making and coordination between Public Works and the ADA Office.	There is no cost impact in making this change. It will enhance the City's compliance monitoring for overall ADA enforcement.	High	The Division is currently developing and implementing a reporting system to ADA; that system should be expanded to incorporate this recommendation.
4-30	The Engineering Division should continue to revise its Standard Drawings to incorporate ADA design issues.	There is no cost impact in making this change. It will enhance the City's compliance monitoring for overall ADA enforcement.	High	The Division is currently developing and implementing a reporting system to ADA; that system should be expanded to incorporate this recommendation.
4-31	The Public Works Department needs to resolve several outstanding issues with the ADA compliance office and establish procedures to be more timely in future matters. There is no cost impact to this recommendation, but it will serve to enhance communications necessary for an effective ADA compliance program.	There is no cost impact in making this change. It will enhance the City's compliance monitoring for overall ADA enforcement.	High	This should be a focus of Departmental attention.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
4-32	<p>The Department should develop a slurry seal-based roadway resurfacing program as a means of maximizing roadway surface improvement at an efficient cost.</p>	<p>The estimated cost benefit is between \$2,000,000 and \$4,700,000 less expensive per year when compared to the expanded program being proposed by the Department.</p> <p>In addition to significant cost savings, this approach can also be expected to reduce maintenance costs when considering the full life costs of Metro's roadways.</p>	High	<p>This represents a dramatic departure from the Department's historic approach to street maintenance and requires considerable planning. As part of its annual street inventory, the Department will need to determine the level of treatment that the respective roadways will need and begin developing a more complex maintenance schedule. In addition, the experience of most governments using slurry programs is that an extensive public information campaign needs to inform the public of what is being done and why.</p> <p>The Department should use experienced contractors to perform the work, applying standards for materials and applications should be equal to, or greater than, the standards established by the Tennessee Department of Transportation for slurry seal treatments.</p> <p>Because of the timing of the current asphalt overlay program and the need to develop a maintenance master plan, the estimated savings will not be realized until the FY 2003-04 fiscal year.</p>

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER IV: ENGINEERING**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
4-33	<p>The MAXIMUS project team recommends that the Department undertake the slurry seal program for a period of two years and evaluate both the costs and results to validate the effectiveness and financial efficiency of the program to determine the need to retain the street paving and milling crews. If the conclusion is to eliminate those crews, then it would be appropriate for the Department also to consider the feasibility of further reducing the number of M & R Supervisors in the Streets and Roads Division.</p>	<p>Assuming that the evaluation concludes that the Department should continue the program, at that time, it would be appropriate to consider elimination of the Department’s street paving and milling crews.</p> <p>Recognizing that the work those crews are performing will still be required—although in less quantity—it could be expected that Metro could realize a cost savings of between ten and thirty percent of labor and equipment costs. For the purpose of this analysis, we believe that a cost reduction of \$200,000 per year would be a reasonable working estimate of additional savings.</p>	Medium	<p>This recommendation needs to be revisited after Metro has implemented a slurry program and evaluated its success.</p>

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER V: DEPARTMENT ADMINISTRATION				
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues	
5-1	<p>The project team recommends that the Office Managers and Office Support Representatives be transferred organizationally from the Human Resources Division the Streets and Roads Divisions and the centers at which they work.</p>	<p>Est. cost: None</p> <p>Est. benefits: Greater accountability of staff at the Centers, and greater flexibility of Streets and Roads management in prioritizing the time of these employees, who effectively work for these managers currently.</p>	Low	There are no complex implementation issues to consider, as this is an organizational change only, which will increase efficiency and effectiveness with which these employees are utilized.
5-2	<p>The Department should establish a goal of integrating training and safety through establishing a formal program of safety training that is focused specifically on the findings of regular safety inspections within the department.</p>	<p>No cost is associated with this recommendation.</p> <p>The expected benefit should be a reduction in preventable accidents in the Department.</p>	Low	There are no significant implementation issues involved.
5-3	<p>The Department should work with Metro Human Resources to develop a training program for supervisors that focuses on meaningful performance evaluations as a means of fostering employee development and encouraging work improvement. The program should start with the Director's Office and go throughout the department. Additionally, the Department's training officer should review all performance evaluations to determine either individual training needs for a given employee or observe any patterns of performance that warrant development of Department-wide training.</p>	<p>There is no cost associated with this recommendation.</p> <p>It can be expected to result in more effective evaluations, enhanced employee training, and better work performance.</p>	Medium	This recommendation should follow implementation of the organizational changes involving human resources.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER V: DEPARTMENT ADMINISTRATION			
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
5-4	The Department needs to secure personnel files by keeping the file cabinets holding personnel records locked at all times, with key access strictly limited.	Est. cost: None Benefits: Greater security of personnel records	High There are no significant implementation issues involved.
5-5	The MAXIMUS project team recommends that the Department amend its accounts receivable process to minimize check handling and use the procedures being established by Metro.	There is no cost associated with this recommendation. The benefit will be improved controls over checks and reduced work load on staff.	High This recommendation should be carried out in coordination with the Metro Treasurer and should be part of an overall accounts receivable strategy by Metro.
5-6	The MAXIMUS project team recommends that the Department develop a procedure to test the accuracy of the collection count.	Est. cost: The current counting house vendor may seek an increase in contract prices if required to provide more detailed counts that are necessary to assure count accuracy. Est. benefit: Assurance that Metro is receiving all of the funds it is due.	High This may require a renegotiation of the current counting house contract.

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER V: DEPARTMENT ADMINISTRATION**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
5-7	The project team recommends that the Department begin immediately to establish the systems and procedures necessary to track and bill the fees that it is authorized to collect. Additionally, we recommend that the Department submit the revised fee ordinance to Metro Council for the Council's consideration at the earliest opportunity.	Est. cost: Staff costs to modify the Metro permit system. Est. benefit: Collection of these fees will result in an estimated revenue of at least \$106,000 per year. A potential issue will be whether the fee will deter people from obtaining required permits.	High	The Department has the established legal authority to collect these fees and to conduct inspections relating thereto. This will require significant coordination with Metro I.S. and the permitting system to develop the appropriate electronic management systems in order to accommodate the number of permits that will be generated. If the fees cannot currently be collected through Metro's permit system, then the Department should use a manual collection system until the permit system can be modified. Because of the time involved in setting up the permitting structure and integrating it into the current permitting system, it is not expected that any revenues will be received until FY2003-04.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER V: DEPARTMENT ADMINISTRATION			
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
5-8	<p>Based on our review of the operations of the Finance functions of the Department of Public Works, the MAXIMUS project team recommends that the Department reorganize and realign its administrative staff.</p>	<p>Including wages and fringe benefits, we estimate that these changes will cost approximately \$170,000.</p> <p>The benefit for this is improved coordination of administrative services, coordination of fleet use, enhanced management of departmental payroll, improved personnel services, and the capability to meet the information technology needs described throughout this report and summarized in this chapter.</p>	<p>High</p> <p>An effective administrative organization will be essential to carry out the other recommendations in this report.</p> <p>This reorganization also calls for transferring administrative functions from the Waste Management, Engineering, and Parking Divisions to create a coordinated administrative capacity.</p>
5-9	<p>Based on our review of the recommendations throughout this report, we further recommend that the Department be reorganized.</p>	<p>The estimated cost of this reorganization is the addition of the Deputy Director position, at an estimated \$85,000, including wages and fringe benefits.</p> <p>This organization will result in improved spans of control, better assignment of duties and responsibilities, and a more effective department.</p>	<p>Medium</p> <p>An effective administrative organization will be essential to carry out the other recommendations in this report. However, Metro is currently recruiting for a permanent Department Director. That individual should have the opportunity to review the organization before it is finalized.</p>

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER V: DEPARTMENT ADMINISTRATION**

Recommendation		Fiscal Impact and Benefits	Priority	Implementation Issues
5-10	The Public Works Department should develop its own internal long range systems plan, working in cooperation with the Metro Information Systems Department and the Office of Management and Budget systems.	<p>While there is no cost associated with the plan if prepared internally and with the support of Metro IT, external assistance would cost between \$50,000 and \$75,000. The cost of implementation is based entirely on the elements ultimately included in the plan.</p> <p>Benefit: A departmental plan will enable the Department to prioritize its information technology needs relative to the departmental mission, thus effectively assigning limited I.T. resources.</p>	High	This work should be coordinated with Metro I.T., with an anticipation that the DPW systems should be integrated with other information technology initiatives within Metro and useable by other Departments of Metro.
5-11	The Department should immediately replace the access doors to the work area, installing, at a minimum, four hour fire doors with secure locks. Access to the area should be strictly limited by the Director of the Department and the Director of Administration.	<p>The cost of these doors is estimated at \$1,000.</p> <p>The benefit will be preventing people from accidentally, or intentionally, damaging the Departments computer networks and phone lines.</p>	High	<p>This is a significant potential security problem that needs immediate action.</p> <p>The Department should request that Facilities Maintenance install locked, 4-hour fire doors on both entries to the building areas housing the Department's servers and phone lines. Access approval should be provided only by the Department Director or Director of Administration.</p>
5-12	The Department has recently begun an effort to document and update its policies and procedures. We strongly recommend that this continue and be given a high work priority.	We do not expect any cost implications to this recommendation.	Medium	This is already in process; its completion should wait on employment of the permanent Department Director.

NASHVILLE DEPARTMENT OF PUBLIC WORKS SUMMARY OF RECOMMENDATIONS CHAPTER V: DEPARTMENT ADMINISTRATION			
Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
5-13	<p>Customer service needs to be a high priority of the Department. It needs to consider all of its actions in terms of how those actions will improve its ability to provide better customer service. This is a summary recommendation that encapsulates many of the recommendations included throughout this report. An internal call system should be part of the Department's work order system, discussed in the Streets and Roads chapter. One immediate step that the Department may wish to consider is how it might be able to integrate with the Customer Service Center that Metro is creating, in order to develop procedures for coordinated call taking, work ordering, and customer reporting.</p>	<p>Est. cost: None directly, but this capacity is included in the cost recommendations for a work order system that would be expected to have call in-take capacity.</p> <p>Benefits: Improved customer relations, enhanced ability to respond to calls for service, improved public reporting.</p>	<p>High</p> <p>This should be undertaken in conjunction with planning for development of Metro's central call center.</p>
5-14	<p>The Public Works Department should develop a department-wide strategic plan to identify and accomplish quantifiable and measurable goals and objectives. This should be done internally.</p>	<p>There is no direct cost associated with an internal planning effort.</p> <p>The benefits will be that the Department can establish specific targets for accomplishment and then track and report them. Organizations which focus their attention on goal achievement are generally successful through improved efficiencies and service effectiveness.</p>	<p>Medium</p> <p>While the Department should begin this process now, final sign-off should be held until the permanent Director is in place.</p>

**NASHVILLE DEPARTMENT OF PUBLIC WORKS
SUMMARY OF RECOMMENDATIONS
CHAPTER V: DEPARTMENT ADMINISTRATION**

	Recommendation	Fiscal Impact and Benefits	Priority	Implementation Issues
5-15	At the earliest opportunity, the Public Works Department and Metro Facilities Management should review the Department's South Fifth Street work complex and develop an intermediate range plan to resolve existing problems and to provide a better work environment for departmental personnel.	<p>A facility study conducted by an external consultant would cost an estimated \$75,000.</p> <p>There should be no cost for conducting the analysis, unless Metro decides to use an external review firm. Costs for implementation will depend upon the overall facilities improvement plan. The focus of the study should be on establishing a work environment that meets state and federal standards and is conducive to effective and efficient work performance by departmental personnel.</p>	Medium	There are no significant implementation issues involved.

The following table provides a summary of the estimated costs and benefits of those recommendations which have specific cost or savings estimates associated with them. In using this table to develop budgetary estimates, the MAXIMUS project team advises as follows:

- Operating costs and revenues are based on an assumption of full year operations. Since many of these recommendations will require planning and lead time, Metro should anticipate that it would incur the costs over a six to nine month period and savings would be realized over a six month period.
- Until the recommended operational and organizational changes are in place and operating, it would be appropriate to assume the lowest level of estimated cost savings.
- As noted in the earlier summary table, we anticipate that the savings for the slurry seal program will not be realized until the FY 2003-04 time period, due to the timing of the work and the need for start-up planning.
- Also as noted in the earlier summary table, we anticipate that the additional permitting revenue will not be received until the FY 2003-04 year, again due to lengthy start-up and system requirements.

NASHVILLE PUBLIC WORKS DEPARTMENT SUMMARY OF ESTIMATED COSTS AND SAVING							
Rec.	Estimated Operating Cost		Estimated Savings (Including Increased Revenue)		Capital Expenses		Comments
	Low	High	Low	High	Low	High	
2-1	405,000	405,000			300,000	300,000	Addition of 5 Signal Technician I's & 4 M&R Worker II's and associated supplies and materials. This includes three bucket trucks.
2-3			54,000	54,000			Allow the Traffic Control Section to submit bid to install traffic signals.
2-4	204,059	204,059			125,000	125,000	Addition of 4 M&R Worker II's in the Signs and Marking Unit and associated supplies and materials. Capital expense is for four additional vehicles.
2-6			57,800	57,800			Combine signal construction and signal maintenance reducing one supervisor position.
2-9			10,500	10,500			Reduction of overtime.

NASHVILLE PUBLIC WORKS DEPARTMENT SUMMARY OF ESTIMATED COSTS AND SAVING							
Rec.	Estimated Operating Cost		Estimated Savings (Including Increased Revenue)		Capital Expenses		Comments
	Low	High	Low	High	Low	High	
2-12					25,000	500,000	Metro Wide Cost for a Job work order system
2-17			104,753	104,753			Reduction of management personnel at two satellite centers.
3-1			85,000	85,000			Savings from converting the chipper service to a fleet based on combining grappler trucks in tandem with trailers.
3-2			116,000	232,000			Savings from changing the chipper service back to a strictly scheduled-route basis in order to facilitate the collection of curbside debris.
4-14					250,000	1,000,000	Metro Wide Cost for a contract/project management system
4-15	400,000	400,000					Eight positions added back in to the Department where the work had not been transferred.
4-17	102,000	120,000					Upgrade positions in the Engineering Division to bolster capital project management and the construction inspection of capital projects.
4-18	130,000	130,000					Increase traffic engineering staffing by two positions and reallocate three other positions for neighborhood traffic management.
4-24					125,000	200,000	Automated parking enforcement system; the cost savings is realized elsewhere.
4-25			15,000	18,000			Returning to civilian parking enforcement personnel.
4-26			2,000,000	4,700,000			Developing a roadway resurfacing program that would include slurry seal at 6, 12, & 18 years and structural overlay at 23 years. It is expected that the savings will be gained beginning in FY2003-04.

NASHVILLE PUBLIC WORKS DEPARTMENT SUMMARY OF ESTIMATED COSTS AND SAVING							
Rec.	Estimated Operating Cost		Estimated Savings (Including Increased Revenue)		Capital Expenses		Comments
	Low	High	Low	High	Low	High	
4-33			200,000	200,000			By undertaking a slurry seal program for two years to evaluate the costs and results to validate the effectiveness and financial efficiency of the program.
5-7			106,000	175,000			New revenue to be earned by collecting fees it is authorized to collect; it is expected that this will be earned in FY2003-04.
5-8	170,000	170,000					Wages and benefits associated with reorganizing the administrative staff.
5-9	85,000	85,000					Addition of a Deputy Director position.
5-10					50,000	75,000	Develop long-range IT plan using external assistance.
5-11					1,000	1,000	Installing doors on rooms where department's network servers and telephone links are maintained.
5-15					75,000	75,000	Cost of external facility management consultant.
Total	\$1,496,059	\$1,514,059	\$2,749,053	\$5,637,053	\$951,000	\$2,276,000	

ATTACHMENT A: PROFILE OF THE PUBLIC WORKS DEPARTMENT Nashville and Davidson County, Tennessee

The pages which follow describe our understanding of the Public Works Department operations based on interviews with the Department's Director, Assistant Director, Division Managers, Superintendents, Internal Audit staff, Finance Department managers and representative numbers of Public Works staff, as well as a review of various reports and development of workload data. This summary provides the results of the project team's data collection and interviews information in two areas:

- It describes our understanding of current organization and staffing of the Department in place during the early part of the audit fieldwork including responsibility assignments.
- It outlines our understanding of the Department's major service programs including, where appropriate, workload and/or service levels.

The purpose of this summary is to document our understanding of major programs and activities by the Department to assure accuracy and to provide the basis for identifying issues for additional analysis.

1. INTRODUCTION

The Department of Public Works provides infrastructure maintenance of paved streets, drains and sidewalks; mows canals, ditches and rights-of-way; provides engineering and contracts management services, as well as administrative services such as financial, contractual, legal and budgetary functions, training coordination, safety training and payroll processing of Departmental time records; provides parking meter services and enforcement, administers special parking zones, and administers a private contract for operation of the City's parking garages and surface lots.

The Director of the Department answers directly to the Mayor and has the overall responsibility for planning, budgeting, directing, and coordinating departmental operations so as to provide services in accordance with the overall guidance provided by the Metro Council.

2. ORGANIZATION

The department is organized into the six divisions of Waste Management, Streets and Roads, Fleet Management, Engineering, Parking, and Staff Services. This audit includes all functions of the Division except for Solid Waste Management (other than Chipper Services) and Fleet Management. These divisions are staffed as shown by the overall Departmental organization chart, as well as the individual charts on the at the end of this report.

3. STAFFING

In the table, which follows, is provided a summary of Public Works staffing and key elements of how staff are scheduled and deployed.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Department Administration	Director Council Liaison Public Information Representative Administrative Assistant	1 1 1 1	<ul style="list-style-type: none"> • The Director provides guidance in the creation and implementation of Department policies, budgets, personnel matters, management controls, planning of annual activities, as well as other related functions. Also, serves as liaison with public, contractors and County management. • The Council Liaison is a new position, created during this project. The Liaison will be responsible for communication with elected officials concerning the status of capital projects. • Although budgeted in the Engineering Division, the Public Information Officer is responsible for answering calls for information and providing public information to other Departments, the news media, and the public on Department activities and work schedules, and for the preparation of general public information statements and brochures. • The Administrative Assistant provides administrative and clerical support to the Director.
Contract Management	Contract Administrator	1	<ul style="list-style-type: none"> • Reports directly to DPW Director as a one-person "Division". • Provides assistance in writing legislation regarding issues such as "satellite city" agreements, excavation ordinance, etc. • Alerts Division Managers as to the expiration dates of contracts, asking if they desire to renew or rebid. • Assists in writing contractual language for non-boilerplate contracts. • Interprets policy for Departmental administration

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Staff Services--Finance	Finance Manager Administrative Assistant Finance Officer 2 Finance Officer 2 (Part Time) Administrative Services Officer 2 Office Support Representative 3 IS Analyst 2 (Network Administrator) IS System Technician 2 (Network Technician)	1 1 1 1 1 2 1 1	<ul style="list-style-type: none"> • Purchasing of materials, supplies, services – liaison with Metro Purchasing, including monitoring and review of procurement card system. • Accounting – processing of Accounts Payable • Receives payments for fees, maintains ledger and deposits funds. • Preparation of fixed asset tracking for Metro compliance with GASB 34 requirements • Monitors and prepares financial reporting for state and federal grants • Manages financial matters for supplies and construction contracts, maintains records of invoices and payments. • Develops and tracks of Department and divisional budgets • Performs routine clerical and administrative duties such as filing and retrieval of documents, answering phones, faxing, etc. • Processes payments and receipts of goods, materials, supplies. • Establishes and maintains contractor reserve or escrow funds • Establishes and monitors local investment pool for the local share of State projects. • Writing of Council legislations (ordinances and resolutions) in conjunction with the Contract Administrator • Administers computer networks, including acquisition, installation, and hardware and networking software maintenance • Coordination of computer systems planning with Department Technology Committee

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Staff Services--Human Resources Division-Administration	Manager Administrative Assistant Equipment and Supply Clerk Maintenance and Repair Worker I	1 1 1 1	<ul style="list-style-type: none"> • Manager oversees Department’s Human Resource functions and personnel. • Provides administrative support to Human Resources Manager. • Maintains personnel files of all staff. • Administrative Assistant reviews payroll data from other centers and performs payroll function for Staff Services; process HR transactions for department; serves as lead person and in-house authority on all HR/payroll transactions. • Reviews and monitors data entered by personnel at other centers • Tracks evaluations of staff and informs centers of employees’ evaluation due date. • Interviews and hires all entry level staff. • Maintains facilities and grounds at the South 5th Street center. • Equipment and Supply Clerk provides internal courier service and performs light building maintenance.
Staff Services--Human Resource Division-Center Support Staff	Office Support Manager Office Support Rep II	3 3	<ul style="list-style-type: none"> • Reports to the Human Resources Manager • Assigned to one of the three Public Works centers. • Performs payroll function for center. Enters exceptions into FastNet weekly. • Maintains leave time information in a separate database. • Maintains “working” personnel files for staff based in center. Prepares evaluations. • Processes work orders and computes project cost data. • Compiles data to create monthly reports for Public Works Department. • Provides administrative support to Public Works’ supervisory and management staff, including interpretation of policies and procedures; assists employees on HR and benefit issues. • Assists Office Support Managers at centers with administrative duties. Answers phones and files. • Helps to process work orders and compile data for monthly reports. • Assigned to each center, Training and Safety divisions.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Staff Services--Human Resources Division- Training	Training Coordinator Office Support Rep II	1 1	<ul style="list-style-type: none"> • Oversees training within Public Works. • Coordinates training provided by various divisions within Public Works, as well as Metro Human Resources and Community Career Center. • Develops and delivers supervisory and management training. • Reviews training requests and seeks most efficient procurement and delivery of training. • Develops and schedules comprehensive training plan. • Maintains training records of staff. Monitors recertification requirements and needs of staff. • Works with supervisors and managers to identify training needs. • Works with Office Support Rep to increase staff awareness of training opportunities. • Offers GED, CDL courses, plus other in-house training. • Provides administrative support to the Training Coordinator. • Develops and distributes flyers regarding training opportunities. • Maintains training records of Department staff.
Staff Services--Human Resources Division- Safety	Safety Coordinator Safety Inspector Office Support Rep II	1 1 1	<ul style="list-style-type: none"> • Oversees Department's compliance to Federal and State safety regulations. • Investigates incidents, including employee accidents and citizen complaints. • Writes and maintains Department's safety policy handbook. • Conducts training courses in accordance with State and Federal requirements. • Works with Metro Safety Department to ensure Public Works adherence to safety requirements; works with training coordinator to develop safety training. • Supports Safety Coordinator. • Conducts internal inspections relating to safety. Inspects work sites and equipment. • Ensures adherence to safety regulations. • Reports violations and unsafe behavior to Coordinator and Department. • Provides administrative support to the Safety coordinator and inspector.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads – Administration	Asst. Director – Streets and Roads Office Manager Secretary Asst. Customer Service Supervisor Customer Service Representative II Office Assistant II Compliance Inspector	1 1 1 1 1 2 1 3	<ul style="list-style-type: none"> • The Assistant Director administers the Streets and Roads. • Compliance Inspectors physically examine sites of complaints after receipt of AIMs work orders. • Assistant Customer Service Supervisor, 2 Customer Service Representatives, and Office Assistant receive, code, log and transmit AIMs work orders to Compliance Inspectors for investigation. This team also closes out work orders as completed.
Streets and Roads – Special Operations Section – Technical Services	Technical Services Coordinator Office Clerk II Engineering Technician III	1 1 3	<ul style="list-style-type: none"> • Inspects roads for various conditions to determine requirements for replacement. • Oversees the rating of roads by private contractor (IMS). • Runs scenarios on street conditions and probable costs of paving. • Maintains database of paved streets, utility “holds”, street ratings and other data. • Identifies optimum street segments for paving based on equitable distribution of funding by District in combination with available funding and street ratings. • Responds to requests for street condition ratings. • Inspects paving performed by contractors for quality and conformance to specifications. • Analyzes requests for street lighting; tests for need based on physical properties of street.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads - Traffic Control Section - Administration	Traffic Control Mgr Signal Technician III	1 1	<ul style="list-style-type: none"> • Manager ensures that traffic control signals operate properly, and that supervisors and employees in each of the 3 sections has necessary resources and materials to complete assigned functions. • Conducts cost calculations of contractor versus in-house projects – makes decisions on feasibility of work based on calculations. • Performs productivity analyses of work crews in Section – makes adjustments in staffing, work standards and methods based on analyses. • Determines priorities of work and communicates to supervisors. • Manager completes and reports performance evaluations of supervisors. • Manager ensures adherence of Section employees to policies and procedures. • Technician reports directly to Manager. • Technician completes electronics PM on signals. • Tech. coordinates inspections of new signal installations by contractors. • Tech. locates and stakes poles for signals.
Streets and Roads - Traffic Control Section – Signal Maintenance Unit	Signal Tech Supervisor Signal Technician III Signal Technician II Signal Technician I	1 2 3 2	<ul style="list-style-type: none"> • Maintains electronic components of traffic signals. • Bench maintenance of signals and controllers performed in shop. • Checks signals for operability prior to contractor installation. • Makes Tenn. One-Calls prior to excavations; responds to these calls as necessary. • Programs controllers, strings wires, changes controller parts. • Schedule: One Tech. works 10:30 p.m. – 6:00 a.m. answering emergency calls, placing temporary signs, performing PM's. Other Techs. rotate through the following shift schedules: <ul style="list-style-type: none"> - M-F, 7:00 a.m. – 3:30 p.m. - M-F, 6:00 a.m. – 2:30 p.m. - M-F, 2:00 p.m. – 10:30 p.m. - M-F, 10:00 p.m. – 6:30 a.m. - Sa-Su, 7:00 a.m. – 3:30 p.m. <p>Note that the same Tech. takes the 10:00 p.m. – 6:30 a.m. shift each week. The other Techs. rotate through the other shifts.</p>

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads - Traffic Control Section – Signal Construction Unit	Signal Maintenance Supervisor M&R Leader III M&R Leader I M&R Worker III M&R Worker II	1 1 1 1 2	<ul style="list-style-type: none"> • Sets poles, controller box change outs, installs video cameras. • Changes lamps in signals as necessary. • Installs some signals, wiring. • PM on signals (change lamps, cleans lenses, repair/replace loops, etc.) • Makes and responds to Tenn. One-calls.
Streets and Roads - Traffic Control Section – Signs and Markings Unit	Signs & Marking Supervisor Maintenance and Repair Leader I Skilled Craft Worker Maintenance and Repair Worker III	1 1 1 4	<ul style="list-style-type: none"> • Responds to AIM’s work orders by performing maintenance or replacing signs. • Designs and fabricates new signs • Oversees striping and marking performed by contractor. Identifies street markings needing re-painting.
Streets and Roads – Special Operations Section – Milling Crew	M&R Leader II EO III EO II EO I M&R Worker II M&R Worker I	1 2 5 2 3 2	<ul style="list-style-type: none"> • Provides all milling services for Metro streets and roads. • Crew operates a variety of equipment, ranging from the milling truck and dump trucks to jack hammer. • Cuts base failures and knots. • Coordinates with paving crew for clean up. • Occasionally, assists with litter removal, alley clean up, and shoulder work. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads – Special Operations Section –Paving Crew	M&R Leader II EO III M&R Worker I EO II M&R Worker II	1 2 4 5 1	<ul style="list-style-type: none"> • Responsible for all paving within Metro that is not assigned to contractors. • Operates asphalt trucks, grader, dump trucks, water truck, and other like equipment. • Hauls materials to job sites, as well as recyclable materials to plants. • Completes some preventative maintenance on equipment. • Supports milling crew with clean up. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads – Special Operations Section –Guardrail and Concrete Crew	M&R Leader I Skilled Craft Worker M&R Worker II M&R Worker I EO III	1 1 2 1 1	<ul style="list-style-type: none"> • Responsible for installing and maintaining Metro guardrails. • Repairs sidewalks. • Completes special projects for Department, including construction and carpentry work. • Constructs sidewalk ramps to meet ADA requirements. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads – Special Operations Section –Sidewalk Crew	M&R Leader I EOIII Skilled Craft Worker M&R Worker I	1 1 2 2	<ul style="list-style-type: none"> • Constructs and repairs sidewalks. • Assists with curb repairs. • Constructs sidewalk ramps to meet ADA requirements. • Supports other crew s as needed. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads – Special Operations Section – Grading/Base Crew	M&R Leader II EO III Skilled Craft Worker EO II M&R Worker II M&R Worker I	1 2 1 1 2 2	<ul style="list-style-type: none"> • Clear cuts trees and topsoil, shoots grade and builds subgrade to widen shoulders of Metro roads for installation of guardrails, and to prepare for construction of parking lots. • Repairs road base failures. • Builds headwalls for larger (e.g., 60” pipe) structures. • Crew is trained to m back up milling machine as necessary. • Hauls debris from work sites to fill areas; sweeps debris from road as work progresses. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads – Special Operations Section –Carpentry Crew	Sr. Carpenter EO III Skilled Craft Worker Blaster M&R Worker II M&R Worker	1 1 1 1 1 1	<ul style="list-style-type: none"> • Performs a variety of carpentry jobs for Department. • Operates concrete truck for sidewalk crew. • Maintains buildings. • Provides dynamite and blasting services to Metro. This is the only position in Metro. • Provides electrical and plumbing work. • Crew will divide to support other crews when they are short staffed for a job. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads – Special Operations Section –Lowboy Crew	EO III	3	<ul style="list-style-type: none"> • Transports all equipment to and from job sites and centers. • Transport broken equipment to mechanics. • Respond to requests throughout the day. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October. • Maintains fill site.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads – Special Operations Section –Materials Management	Parts Supervisor	1	<ul style="list-style-type: none"> • Receives, disburses, accounts for, monitors and purchases materials in warehouse. • Serves as USAR coordination point in Metro. • Serves as HazMat coordination point for Public Works.
	Equipment Supply Clerk I	1	
	Equipment Supply Clerk II	1	
Streets and Roads – Special Operations Section –CBD Night Crew	Sanitation Supervisor	1	<ul style="list-style-type: none"> • Sweeps downtown business district streets on periodic basis. • Picks up litter in CBD. • Cleans alleys in CBD. • Periodically cleans and maintains street furniture, tree wells, litter receptacles.
	EO III	4	
	M&R Worker I	18	
Streets and Roads - Shoulder Crew	WEST		<ul style="list-style-type: none"> • Responsible for the construction of all shoulders. • Repairs shoulders. • Widens shoulders. • Rebuild alleys. • Operates grader, power broom, front ender loader, truck and other like equipment. • Cleans alleys, storm drains, inlets, and repairs ditches as needed during the winter months. • Paving crew generates most shoulder work orders for the Shoulder crew. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
	M&R Leader II	1	
	EO III	2	
	EO II	2	
	EO I	1	
	M&R Worker II	1	
	M&R Worker I	2	
	EAST		
	M&R Leader II	1	
	EO III	2	
	EO II	1	
	EO I	2	
	M&R Worker I	2	

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads- Tree Crew	WEST M&R Leader II EO III EO II M&R Worker II M&R Worker I EAST M&R Leader II EO III EO II EO I M&R Worker I	1 1 2 2 3 1 2 1 1 4	<ul style="list-style-type: none"> • Responsible for removal of trees, including cutting, chipping and hauling. • Completes roadside trimming. • Operates equipment including, loader, chipper, dump truck as well as chain saws. • Responsible for storm clean up. Receives support from other crews during emergencies and high workload volumes. • Other crews provide assistance during emergencies and storm clean up. • Trims trees along right-of-ways. • East center crew operates the sweeper when necessary. • Assists with cemetery as needed. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads- Construction Crew	WEST M&R Leader II EO III EO II EO I M&R Worker II M&R Worker I EAST M&R Leader II EO III EO II EO I M&R Worker II M&R Worker I	1 1 1 1 1 1 1 1 1 1 3	<ul style="list-style-type: none"> • Constructs ditches. • Installs and repairs base failures, cross drains, and driveway pipes. • Builds alleys. • Repairs pipes and ditches. • Cleans ditches during winter months. • Operates backhoe, roller, mower, concrete saw, front end loader, and jack hammer. • Also, builds headwalls and cuts right-of-ways. • Digs graves and buries persons for Metro. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.

Function	Staffing by Classification	Key Elements of Staffing and Scheduling
Streets and Roads-Patch Crew	<p>WEST M&R Leader I 2 M&R Worker I 4</p> <p>EAST M&R Leader I 2 M&R Worker I 4</p>	<ul style="list-style-type: none"> Repairs potholes and shoulders. Ramp driveways and constructs ramps in accordance with ADA requirements. Equipment used includes roller, power rakes, and sledge hammers. Transports materials and provides patch work to other crews' job sites as necessary. Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads-Drainage Crew	<p>WEST M&R Leader I 1 EO II 2 M&R Worker I 2</p> <p>EAST M&R Worker I 1 EO II 1 M&R Worker I 1</p>	<ul style="list-style-type: none"> Maintains drains and pipes, cross drains. Installs driveway pipes. Cleans pipes and storm drains. Sets curb lines. Cleans inlets, curbs, and yard debris when finished with work orders, as well as brush removal and trim right-of-ways. Supports construction with graveyard work. Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads-Mason Crew	<p>WEST M&R Leader I 1 Skilled Craft Worker 1 M&R Worker I 2</p> <p>EAST M&R Leader I 1 EO II 1 M&R Worker I 2</p>	<ul style="list-style-type: none"> Builds headwalls. Constructs and maintains catch basins. Lay rock for storm drain boxes. Operates jack hammer and uses hand tools. Digs and stacks rock for projects during slower months. Also, cleans pipes, catch basins, gutters, ditches, alleys and dumpsites. Trims limbs and right-of-ways. Repairs shoulders. Supports other crews as needed. Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Streets and Roads-Storm Sewer Crew	WEST M&R Leader I EO III EO I M&R Worker I EAST M&R Leader II EO III EO II M&R Worker I	1 1 1 3 2 1 2 3	<ul style="list-style-type: none"> • Installs pipes, cross drains, and catch basins. • Repairs drainage systems damages. • Also, cuts blind corners and roadsides. • Responds to roadside flooding. • Repairs shoulders. • Supports construction crew with graveyard work. • When work is completed, crew cleans curbs, gutters, and dumpsite. Trim right-of-ways. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads-Mowing Crew	WEST M&R Leader I EO II EO I EAST M&R Leader I EO I M&R Worker I	1 1 4 1 1 1	<ul style="list-style-type: none"> • Mow Metro grounds on a rotating schedule, as well as respond to work order requests. • During winter months and/or poor weather, crew cleans dump sites, cleans and trims alleys, removes litter, and trims overhanging limbs. • Supports other crews as needed. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads-Median Crew	WEST Sanitation Leader M&R Worker I EAST Sanitation Leader M&R Worker I	1 2 1 3	<ul style="list-style-type: none"> • Maintains medians. • Mows, trims, and rakes right-of-ways on a 2 week rotating schedule from April to October. • Cleans and cuts alleys. • Cleans inlets, curbs, and blind corners. • Supports other crews as necessary. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.

Function	Staffing by Classification	Key Elements of Staffing and Scheduling
Streets and Roads- Street Cleaning Crew	WEST EO II M&R Worker I EAST M&R Leader I M&R Worker I	<ul style="list-style-type: none"> • Maintains grounds surrounding sidewalks, cleans and cuts bushes and grass. • Monday and Thursday mornings, crew completes route to remove trash from “baskets.” The packer is operated during this time. • Operates spray truck, which sprays herbicide on sidewalks. • Winter months’ activities include litter and/or brush collection and removal, as well as dumpsite clean up. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads- Lot Crew	WEST M&R Leader I EO II M&R Worker I EAST M&R Leader I EO III EO II EO I M&R Worker I M&R Worker II	<ul style="list-style-type: none"> • Responsible for the maintenance and repair of vacant and abandon lots within center area. • Removes litter and larger dumped items, mows property, and trim bushes. • Operates mower, weed eaters, chain saws, and trucks. • Receives work orders from Code department, which has sent prior notification to lot owners. • Photographs lot sites for records. • Also, cuts and cleans alleys. • Supports other crews as needed. • Works 6:30 am to 3:00 pm from October to April and 4-10 hour shifts from 6:00 am to 4:30 from April to October.
Streets and Roads- Center-Shop Maintenance/Night Watch Crew	WEST M&R Worker I EAST EO II	<ul style="list-style-type: none"> • Provides night security for centers and fuels all trucks and equipment.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Waste Management Division – Chipper Service	Asst. Director Solid Waste Supv. Route Supervisor	1 1 4	<ul style="list-style-type: none"> • Chipper Service is one of several functions performed in the Solid Waste Division of Public Works, consuming only a portion of the time of the administrative staff represented in this section of the profile. • Oversees the operations of 2 private contractors collecting and disposing of curbside brush on 20 routes in Metro. • Monitors the quality of services, and tracks productivity of crews. • Designs and refines routes for brush collection.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Parking Division	Assistant Director	1	<ul style="list-style-type: none"> • Assistant Director current works on a part-time (3 days per week) basis, supervising operations of this Division and makes recommendations to the Traffic and Parking Commission. • Finance officer monitors financial reporting of garage contract, receives and processes payments for the garage contract. • Finance officer bills for special zones, receives and records payments, and prepares special reports as requested. • Administrative Service Officer supervises work of the meter repair and collections staff and parking meter enforcement officers, investigates requests for special zones. • Maintenance and repair worker install and maintain meters and parking zone signage, collects parking meter revenues. • The Corrections Officers are hired by the Sheriff's Office and serve on 6-month rotations with this Division, patrolling parking meters and parking zones and issuing violation tickets.
	Finance Officer II	1	
	Administrative Service Officer III	1	
	Maintenance and Repair Worker II	1	
	Maintenance and Repair Worker I	2	
	Corrections Officers	6	

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Administration	Assistant Director - Engineering	1	<ul style="list-style-type: none"> The Assistant Director provides direction in the creation and implementation of division policies, budgets, personnel matters, management controls, planning of annual activities, as well as other related functions. Also, serves as liaison with public, contractors and Metro Nashville management.
	Office Support Manager	1	<ul style="list-style-type: none"> Provides administrative support to the Assistant Director – Engineering, and supervises the Office Support Representative 2
	Office Support Representative 2	1	<ul style="list-style-type: none"> Acts as the receptionist for the Division. Provides administrative support including the performance of clerical and administrative duties such as filing and retrieval of documents, answering phones, faxing, etc.
Traffic Engineering	Engineer 3	1	<ul style="list-style-type: none"> Manages the Traffic Engineering Section. Supervises two staff: an Engineer 2 and an Engineer 1. Prepares Traffic and Parking Commission agenda items. Makes presentations to the Commission.
	Engineer 2	1	<ul style="list-style-type: none"> Supervises six staff including an Engineer 1, two Engineering Technician 3’s, an Engineering Technician 2, and two Engineering Technician 1’s. Receives requests from the public regarding installation/modification of traffic control devices and assigns staff to conduct studies regarding these requests (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc.). Reviews development submittals (subdivision plats, commercial and industrial building permits) referred by the Planning Department and Code Enforcement Department. Reviews the associated traffic impact studies, proposed mitigation measures, site layout, and attends Planning Commission meetings. Reviews proposed driveways for zoning/building permit approvals to assure the driveways will not create egress and ingress problems. Review approximately four to five a week. Prepares zoning appeals agenda items. Makes presentations to the Zoning Appeal Board.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Engineer 1	1	<ul style="list-style-type: none"> Allocates 70% of his time to conducting studies regarding installation/modification of traffic control devices in response to requests from the public (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc.). Assigned four to five geographical districts. Allocates the remaining 30% of his time to the review of development submittals (subdivision plats, commercial and industrial building permits) referred by the Planning Department and Code Enforcement Department. Reviews the associated traffic impact studies, the proposed mitigation measures, site layout, and attends Planning Commission meetings.
	Engineering Technician 3 Engineering Technician I	2 1	<ul style="list-style-type: none"> Conduct studies regarding installation/modification of traffic control devices in response to requests from the public (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc.). Each of these technicians are assigned to 8 to 9 geographical districts.
	Engineering Technician 2	1	<ul style="list-style-type: none"> Allocates 50% of her time to conducting studies regarding installation/modification of traffic control devices in response to requests from the public (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc.). Allocates the remaining 50% of her time to the data entry of each of the requests received from the public regarding traffic control devices, in terms of the date received, the location, the name of the citizen, the recommendation of staff, etc. The Engineering Technician 2 also assists in manual traffic counts at peak hours (i.e., 7 a.m. to 9 a.m., 11 a.m. to 1 p.m., and 4 p.m. to 6 p.m.) to determine exactly what the traffic counts are at those hours, the number of left and right hand turns, etc.
	Engineering Technician 1	1	<ul style="list-style-type: none"> Conducts traffic counts using eight new traffic counters. These are computer-based traffic counters. Files all of the accident reports received from the Police Department.
	Engineer 1	1	<ul style="list-style-type: none"> Supervises an Engineer 1 and an Engineering Technician 3. Designs traffic signals for road widening or modifications to existing signals using AutoCAD. Conducts modification studies of traffic signals such as signal timing, loops, programming, etc.
	Engineer 1	1	<ul style="list-style-type: none"> Allocates 25% of his time to signal design, 50% of his time to conducting studies regarding installation/modification of traffic control devices in response to requests from the public (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc.), and 25% of his time to collecting data in intersections for signal design.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Engineering Technician 3		<ul style="list-style-type: none"> • Maintains inventory of traffic signals, school flashers, etc. • Maintains an inventory of signal capital improvement projects including the date of approval, design, construction cost, etc.
Capital Projects Management	Engineer 3	1	<ul style="list-style-type: none"> • Supervises seven staff: two Engineer 2's, three Engineer 1's, an Engineering Technician 3, and a Technical Services Coordinator. • Manages the capital projects program for the Engineering Division.
	Engineering Technician 3 Engineering Technician 2	2 1	<ul style="list-style-type: none"> • Provide street addresses and names for new development after the plat is recorded. Utilize the Land Information System to maintain the street name index. • Microfilm plans including plat grading and drainage plans, and plat construction plans. • Maintain the Street and Alley index. Index of streets and alleys owned and maintained by Metro Nashville. Update with new streets and alleys resulting from development. At the end-of-the-year, prepare a report for the City Council formally accepting the new streets and alleys. Also update mylars to reflect the new streets and alleys. • Research right-of-way in response to questions from the public. Maintain a database regarding right-of-way. • Maintain the E-911 database, inputting new addresses, on behalf of utilities, U.S. Post Office, and public safety services.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Engineer 2	1	<ul style="list-style-type: none"> • Supervises an Engineering Technician 3, the survey crew, and manages the design and construction of capital improvement projects, primarily bridges. • There are 384 Metro Nashville bridges over twenty feet in length. These are inspected once every other year by TDOT. The last inspection generated a list of 66 bridges in need of repair with the repair ranging from the simple to the complex. \$1.2 million is available for repairs and the consulting engineer retained to evaluate and prioritize the 66 bridges needing repair. • Supervising a consulting engineer retained to evaluate and prioritize the 66 bridges needing repair. The consultant is approximately 10% to 15% complete in this evaluation. The Engineer 2 is allocating an estimated 15% to 20% of his time to the supervision of the bridge consultant. • Allocating a large proportion of time bridge capital improvement projects that are being designed and their construction managed by TDOT. These include the following: <ul style="list-style-type: none"> - <u>Gateway Bridge</u> (\$36,965,627) project number 94-B-1. This project is under construction, and will be completed in another 2 ½ years. It is approximately 5% to 10% complete at present. Allocating an estimated 25% of his time to this project, but this allocation will increase. - <u>Gateway Corridor</u> (\$6,380,121) project number 95-R-1. This project is under design and is approximately 75% complete in terms of design. This is a road-widening project: two lanes to six lanes. This project will begin construction this fall, and be completed in another 1-½ years. Allocating an estimated 15% of his time to this project. - <u>Shelby Bridge</u> (Phase one: \$5,354,054. Phase two: \$6,550,144) project number 97-B-4. Phase one is 98% complete. Phase two is 10% to 15% complete. Phase two will be completed in mid 2003. Allocating an estimated 20% to 25% of his time to this project. • Managing the design and construction of various other capital projects including the following: <ul style="list-style-type: none"> - <u>Shelby Avenue Extension</u> (\$500,000). Designed by consulting engineer. Design has not yet begun; design will be completed by April or May 2002, and construction completed in late fall 2002. Allocating an estimated 10% of his time to this project. - <u>Shelby Avenue Phase 2B Pier Rehabilitation</u> (\$1,483,308). Design completed. Bid in late spring. Construction will require three to four months. Allocating an estimated 5% of his time to this project.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
			<ul style="list-style-type: none"> - <u>Polk Avenue Bridge Rehabilitation (\$737,581)</u>. Design is 95% complete. CSX is requesting some design changes. Using a bridge consultant to respond to design change request. Construction planned for this fall. - <u>Chestnut Street (\$1,500,000)</u>. Design has not yet begun. Will utilize consulting engineer.
	Engineering Technician 3	1	<ul style="list-style-type: none"> • Converts the raw data collected by the survey crew to base maps so that the engineers can begin the design with the base maps. Occasionally goes out into the field to fill in for sick or vacation leave in the survey crew.
	Engineering Technician 2 Maintenance and Repair Worker 2	1	<ul style="list-style-type: none"> • These three staff function as the survey crew. Use total station survey equipment.
	Engineering Technician 1	1	
	Engineer 2	1	<ul style="list-style-type: none"> • Supervises a Technical Services Coordinator, and designs and manages the construction of capital projects. Management of construction projects focused in particular on sidewalk capital improvement projects (\$30 million) and City Council infrastructure projects (\$3.2 million) at present. • Designing three capital improvement projects including Dickerson Pike (\$193,000), Lebanon Pike (\$130,000), and Beamon Park Road (unknown construction cost). Also is supervising the consultant re-design of the Rural Hill Road intersection improvement project (\$1.1 million) and working with the Engineer 1 on the signal design for this intersection. This project was designed approximately fifteen years ago, but “tabled” for lack of funding. • Allocates an estimated 25% of his time to the design of these four capital improvement projects and 75% of his time to the sidewalk capital improvement projects and the City Council initiated capital improvement projects. This includes responding to public complaints, providing data to other staff and the City Council regarding the status of capital improvement projects, etc.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Technical Services Coordinator	1	<ul style="list-style-type: none"> • Almost all of the time of the Technical Services Coordinator and the three Engineering Technician 3's is allocated to construction inspection of the sidewalk capital improvement projects (\$15 million currently allocated to sidewalk construction contracts). • The Office Support Representative 3 provides clerical support for construction inspection including inputting sidewalk construction data into an Access database regarding handicap ramps to provide a report to the Finance Department. Forward approximately 10 to 25 reports to the Finance Department each week. Generates progress letters to the City Council regarding the status of Council initiated capital projects, and abatement letters to utilities regarding the existence of utility poles in Metro's right-of-way based upon information provided by Engineering Technician 3's.
	Engineering Technician 3	3	
	Office Support Representative 3	1	<ul style="list-style-type: none"> • Project manager for capital improvement projects including the following: <ul style="list-style-type: none"> - <u>Traffic calming project</u> (\$500,000) project number? This project is on hold pending an evaluation of the public support for traffic calming devices in the five pilot neighborhoods. A public survey firm – Segenthaler – was retained to conduct the survey. The traffic calming project is meeting intensive requiring three meetings for each neighborhood. - <u>Pedestrian and bike path pilot project</u> (\$300,000) project number? Design is completed; getting ready to seek bids. The project includes bike paths, bike lanes, bike path signing and marking, bike-friendly catch basins, etc. • Allocates 50% of his time at the Civic Design Center as the representative for the Engineering Division. The Civic Design Center provides pre-application review for developers.
	Engineer 1	1	

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Engineer 1	1	<p>Design capital improvement projects. Currently working on the following projects:</p> <ul style="list-style-type: none"> • Bell Road/Smith Springs intersection (\$1,200,000) project number 94-R-3. Road widening for two intersections. Design is 80% complete. • Neelys Bend road extension (\$800,000) project number 99-R-6. Design is 100% complete. Right-of-way being acquired. • Whitland Avenue drainage improvements (\$250,000) project number 99-D-13. Construction is 33% complete. Two-month construction period. Tier 2 contract. • Ewing Creek house raising for flood mitigation (\$550,000) project number? Metro Housing Authority coordinating the work. The Engineer 1 obtained the cost estimates. • Ensworth cul de sac (\$10,000) project number? 0% design completed. Survey data being collected. Right-of-way being acquired. • Edmondson Pike (\$10,000) project number? Design completed. Construction has not yet begun.
	Engineer 1	1	<ul style="list-style-type: none"> • Construction project manager for capital improvement projects and plan checks commercial and industrial building permit submittals. • Currently closing out the construction of four capital improvement projects including Music Valley Drive, Larkin Springs, Douglas Avenue, and Dotson Chapel Road. These four projects are at final payment/adjustment stage. • Allocating an estimated 10% of her time to assisting another Engineer 1 in the construction management of Whitland Avenue drainage improvements. • Allocating an estimated 80% of her time to the sidewalk capital improvement program including the preparation of a sidewalk/bike path master plan by a consulting engineer (Bob Murphy – contract amount is \$500,000) and the administration of the contract with USI Infrastructure for the construction inspection of the sidewalk capital improvement project (contract is a not-to-exceed amount of \$1,500,000). • Allocating an estimated 10% of her time to plan check of commercial and industrial building permit submittals.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Technical Services Coordinator	1	<p>GIS Coordinator for the Engineering Division. Performs a number of functions including the following:</p> <ul style="list-style-type: none"> • Installs software for the staff of the Engineering Division and gets the software up and running. • Provides initial/brief tutorials. • Provides training in the use of ARC View. • Completes the more difficult GIS maps for staff of the Engineering Division. • Prepares databases for linkage to ARC Info. Recently prepared the bridges database and set up the procedures for data entry (the actual data was entered into the database by the CAD/GIS Analyst 1). Also recently prepared a database for capital improvement projects digitizing the geographic information and joining the Access database to ARC Info. • Keep AutoCAD 2002 up and running on the network. • Serve on the computer committee for the Public Works Department along with two other staff from the Engineering Division. Meet monthly to discuss information technology issues and approve/disapprove software purchases.
	CAD/GIS Analyst 1	1	<ul style="list-style-type: none"> • Allocates approximately 75% of his time providing computer aided design support for an Engineer 2. Provides little support to other engineers. Uses AutoCAD 2002 and Eaglepoint (to create profiles, quantity takeoffs, insert borders, etc.). Prepares profiles and cross sections for the Engineer 2. • Developing CAD standards for the Engineering Division. • The remaining 25% of his time is allocated to ARC View such as populating the bridge database.
Excavation, Encroachment, and Street Closure Permits	Technical Specialist 2	1	<ul style="list-style-type: none"> • Supervises the Engineering Technician 2, the two Office Support Specialist 3's, and the seven Engineering Technician 3's. • Completes the plan checks for commercial and industrial building permits for handicap ramps, curbs, sidewalks, and driveways and assure these improvements are built according to standard details.
	Engineering Technician 2	1	<ul style="list-style-type: none"> • This position is vacant, and has been for approximately a year. When filled, it was assigned to the office and assigned responsibility for completing the plan check of the smaller commercial and industrial building permits handicap ramps, curbs, sidewalks, driveways and assure these improvements are built according to standard details

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Office Support Specialist 3	2	<ul style="list-style-type: none"> Answer phones (approximately 105 phone calls per day), issue street closure, excavation, and encroachment permits. Take complaints from the public regarding excavation and street closure permits, and contact the contractor to resolve the problem.
	Engineering Technician 3	7	<ul style="list-style-type: none"> Inspect excavation cuts, both the backfill and the final, inspect encroachment permits, and inspect street closures for barricading and warning signs. Assigned to geographical areas.
Stormwater Services (Note: The NPDES function was transferred to the Water Department during the period of this study.)	Engineer 3	1	<ul style="list-style-type: none"> Supervises three staff including the Engineer 2 assigned to plat plan checking, the Engineer 2 assigned to Storm Water Discharge Enforcement, and the Technical Services Coordinator assigned to construction inspection.
	Technical Services Coordinator Engineering Technician 3	1 4	<ul style="list-style-type: none"> Inspect the construction of public improvements resulting from development including plats and commercial/industrial permits. This includes streets, sidewalks, drainage, curb and gutter, driveways in the right of way, storm drains, detention ponds, and grading. Also handle complaints received from the public regarding construction such as illegal dumping, debris and dirt on streets, erosion control measures, etc. The Technical Services Coordinator allocates approximately 50% of his time to construction inspection, and the remaining 50% to development of bond estimates for the improvements resulting from development.
	Engineer 2 Engineer 1 Engineer-In-Training	1 1 1	<ul style="list-style-type: none"> Plan check preliminary/final plats and construction plans.
	Engineer 1	1	<ul style="list-style-type: none"> Physically based at the Code Enforcement Department. Provides engineering review for building permits, primarily single lot development.
	Engineering Technician 3	1	<ul style="list-style-type: none"> Provides flood plain information to the public including whether parcels are/are not located within the flood plain.
	Engineer 2	1	<ul style="list-style-type: none"> Supervises the Storm Water Discharge Enforcement program including six staff including a Technical Services Coordinator, two Engineering Technician 3's, two Engineering Technician 2's and an Office Support Representative 3.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
	Engineering Technician 3 Engineering Technician 2	1 1	<ul style="list-style-type: none"> Field screening program designed to identify non-storm water discharges into the storm water collection system and identify their sources. An estimated 4,274 major outfalls have been evaluated over the past two years. Only 139 sites were found to have storm water flow. The major outfalls must be field screened once every two years. An “outfall” includes such items as outfalls from a piped storm water conveyance as well as ditches or other channels. These two staff collect storm water samples in the field. Use a small lab kit to test for pH, dissolved oxygen, TR chlorine, total copper, total phenol, detergents, ammonia, fluoride, temperature. Attempting to identify illegal discharges into the storm water system. Didn’t find that many illegal discharges; recommending a modification for the next five year permit to reduce the extent of sampling for the rural areas of Metro Nashville.
	Engineering Technician 3	1	<ul style="list-style-type: none"> Conducts the ambient stream monitoring program. Collects regular grab samples from established points in streams and assesses of the biology and stability of selected streams at eight locations.
	Technical Services Coordinator	1	<ul style="list-style-type: none"> Conduct industrial inspections of approximately 74 high-risk industrial facilities, as required by the five-year permit, to monitor and control pollutants in storm water runoff. The goal of the initial inspection is to determine if chemicals present at the industry are utilized, stored, moved, disposed of, etc. in a manner that can contribute to storm water pollution. Sampling of runoff will be conducted (foam, odor, stains, etc. visible at the outfall). Storm water monitoring is conducted booth via automatic sampling devices and manual sampling techniques. Maintains the databases including the complaint database, an up-to-date inventory of the storm water infrastructure.
	Engineering Technician 2	1	<ul style="list-style-type: none"> This position is vacant. The position, when filled, did work with the Engineering Technician 3 collecting ambient monitoring samples. The position, when filled, will maintain an inventory of the storm water devices in GIS (i.e., oil and water separators, detention ponds, etc.). The intent will be to make sure these devices are maintained.

Function	Staffing by Classification		Key Elements of Staffing and Scheduling
Intelligent Transportation System	Engineer 1	1	<ul style="list-style-type: none"> Project manager for the development of the intelligent transportation system (ITS) within Metro Nashville. The Engineering Division has obtained \$16,526,028 in grants from the federal government for the implementation of an Intelligent Transportation System. The local match for these grants amounts to \$1,368,991. This includes eleven separate capital improvement projects. The plan for deployment is (1) design and construct a new traffic operations center as the hub of the ITS; (2) update all traffic signal controller devices to digital technology; (3) update outdated traffic signal display and detector technology on key arterials; (4) install a fiber optic communications backbone for integration of the ITS; (5) install video surveillance on major arterials for monitoring traffic; (6) install vehicle system detection on major arterials for monitoring traffic conditions and collecting historical traffic data; (7) integrate the traffic signal, video surveillance, and vehicle detection systems into a unified arterial management system; and (8) integrate Metro Nashville's arterial management system with TDOT's regional transportation management center and Metro Nashville's emergency operations center.

4. SUMMARY OF OPERATIONS

In the section of the report, which follows, is provided a summary outline of key indicators of Public Works programs and services, staffing and operations in Nashville and Davidson County. In the table, which follows, is provided a summary of the programs and services provided by the Public Works Department. Key workload and service level indicators are also provided.

Function	Description of Services	Workload and Service Levels
Administration	<ul style="list-style-type: none"> • Communicates Departmental requirements and activities to City Administration, elected officials, and advisory boards • Establish goals/strategies for the Dept. and each division. • Directs special projects. • Conducts Department public information program 	<ul style="list-style-type: none"> • Hours of operation – 8:00 a.m. till 4:30 p.m. Mon. through Fri.
Contracts Management	<ul style="list-style-type: none"> • Maintains list of current contracts • Provides policy advice to Department • Prepares Council legislation 	<ul style="list-style-type: none"> • The Department currently has 314 open contracts and purchase orders • Total open value of contracts and purchase orders is \$13,288,986 • Works an 8:00 to 5:00 Monday through Friday schedule.

Function	Description of Services	Workload and Service Levels
Staff Services--Finance	<ul style="list-style-type: none"> • Develops and administers Department budget • Manage departmental records. • Receives and processes payment authorizations • Provides accounting and bookkeeping services for the Department. • Processes purchase requisitions for DPW purchases. • Provides computer network support • Collects and reports revenues from fees, contracts, and special zone programs 	<ul style="list-style-type: none"> • Maintenance call log indicates approximately 168 departmental facility repair orders since July 24, 2000 • Processes approximately 100 procurement card transactions per month • Supports approximately 140 personal computers, 5-6 plotters, 1 large print canner, 3 standard scanners, 20 printers, 7 NT network servers, 1 OS-2 server, 1 Novell network • Maintains Novell network because Engineering Division has not converted legacy applications from dBASE module. • Administrative Services staff generally work from 8:00 a.m. to 4:30 p.m.

Function	Description of Services	Workload and Service Levels
Staff Services--Human Resources	<ul style="list-style-type: none"> • Processes payroll for the employees of the Department. • Assesses training needs of Department employees, implements training programs in response to department needs, and maintains records of previous training by employee. • Assesses safety practices of Department employees and acquires or develops corrective actions. • Assists operating centers in the interpretation of departmental and Metro policies and procedures. • Assists operating centers in the typing, filing, faxing, phone answering and record-keeping related to operations. • Assesses Department compliance with State and federal employment law. • Coordinates administration of employee grievance system. • Coordinates employee recruitment and insures compliance with civil service requirements. • Administers Metro substance abuse program for Department. 	<ul style="list-style-type: none"> • Processes payroll twice per month. • Provides policy and procedure interpretation as requested.

Function	Description of Services	Workload and Service Levels
<p>Streets and Roads- Special Operations, East and West Centers</p>	<ul style="list-style-type: none"> • Conducts maintenance and repair of Metro streets, roads, guardrails, sidewalks, alleys, bridges, drains, and street lighting. • Paves roads with in-house crew. • Conducts maintenance and repair of Metro sidewalks. • Oversees contracts for the pavement of Metro streets. • Oversees the rating of Metro streets through contract with private vendor. Runs scenarios on cost of paving under multiple assumptions. Identifies streets for paving after scenario runs, as well as through communication with Metro Council. • Sweeps downtown district streets; oversees contracts for the sweeping of other streets. • Mills roads as necessary. • At the two remote centers in the east and west sections of Metro, maintain trees, mow rights of way, widen road shoulders, repair drainage problems, patch potholes, build and repair headwalls, clean vacant lots, pick up roadside litter, and other activities. • Coordinates the receipt and disbursal of inventory at warehouse. 	<ul style="list-style-type: none"> • Targeted service level is to respond to and complete action on all service calls within 30 days and potholes within 24 hours. • Maintains 2,154 center line miles of roadway (or, alternatively, 32,507,915 sq. yds.) • Repaved 110 center line miles in 2001, equating to 5.1% of total inventory. • East Center used 1,579 tons of asphalt mix in patching operations in 2001. (263 tons per crew member). • West Center used 2,437 tons of asphalt in patching operations in 2001. (406 tons per crew member). • East Center cleaned 93,052 ft. of ditch in 2001. • West Center cleaned 97,380 ft. of ditch in 2001. • East Center cleaned 13,456 ft. of pipe in 2001. • West Center cleaned 54,332 ft. of ditch in 2001. • East Center installed 1,251 ft. of pipe in 2001. • West Center installed 1,393 ft. of pipe in 2001. • Special Ops. Paving Crew poured 14,420 tons of asphalt in 2001. • Special Ops. Milling Crew milled 884,542 sq. yds. in 2001. • Special Ops. Sidewalk Crew repaired 22,098 sq. ft. of sidewalk in 2001. This crew also replaced 44,509 sq. ft. of

Function	Description of Services	Workload and Service Levels
		sidewalk in 2001. <ul style="list-style-type: none">• Downtown street sweeping crews swept 15,795 curb miles in 2001.• Streets in East and West Centers are swept by Sweeper Corp. of America (SCA), at \$26.96 per curb mile.

Function	Description of Services	Workload and Service Levels
<p>Streets and Roads – Traffic Control</p>	<ul style="list-style-type: none"> • Designs and oversees the installation of new and modified traffic signals. • Maintains and repairs all signalized intersections in Metro, by relamping, cleaning lenses, preventively maintaining electronics, etc. • Designs, fabricates, installs and repairs road signs. • Oversees the contract striping of streets. • Coordinates Tennessee One-Calls as necessary. • Places temporary traffic control devices for special events. 	<ul style="list-style-type: none"> • Responsible for the maintenance of approximately 800 traffic signals. • Maintains approximately 86,000 signs Metro-wide. • Ensures response to Tenn. One-calls within 72 hours of receipt. • Targeted service level of performing PM on signals once per year. Analysis of records indicates that none were preventively re-lamped in 2001. • Targeted service level of performing electronic PM on signals once per 2 years. • With 12 field traffic technician positions, the ratio of signalized intersections to technicians in approximately 67:1. • The Sign Shop manufactured 4,677 sign in 2001. Additionally, the Unit replaced 3,903 signs in 2001, or about 15.6 per working day. With 4 crew members, each working 200 days per year, this equates to approximately 4.8 signs replaced per crew member per day. • Oversight of the striping of 140 miles of 4” white and yellow lines, 40 miles of 6” lines, 4,266 feet of stop bars, 8,499 linear feet of 8” barrier line, 2,885 feet of 12” line, 4,287 feet of international crosswalk line, and other striping on Metro streets and parking lots.

Function	Description of Services	Workload and Service Levels
<p>Waste Management – Chipper Service Section</p>	<ul style="list-style-type: none"> • Assign routes to contractor crews. • 4 Supervisors monitor brush pick up by private crews. • Track complaints and requests for services on automated database. • 20 chipper trucks (at maximum service level) pick up and chip yard brush on demand. These trucks also ensure that each of approximately 137,000 Metro residences receives service 5 times annually through following regular routes after picking up “call in” brush requests. 	<ul style="list-style-type: none"> • Target service level = pick up brush on routes 5 times per year at each Metro residence. • Pick up brush on 20 routes; 17 by Queens, and 3 by Expert Services. • Queens collected 9,813 tons of brush in FY01. This equates to \$165.88 per ton, with an average of 48.1 tons collected per truck. • Expert Services collected 1,696 tons in FY01, equating to \$206.10 per ton. Expert Services averaged 62.8 tons per truck. • Metro crews collected 955 tons in FY01, averaging 19.9 tons per truck. • A total of 12,464 tons of brush were collected in Metro in FY01.

Function	Description of Services	Workload and Service Levels
<p>Parking</p>	<ul style="list-style-type: none"> • The City’s three garages and two surface lots are operated under private contract. The current terms of the contract are a base fee of \$20,000 per year plus 4% of the gross receipts over \$1,275,000. The City is currently considering whether to execute a six-month renewal option that can be exercised in March, 2002. • Under the terms of the garage, the private contractor provides staffing and basic janitorial services; the City is responsible for all other operational and maintenance expenses, covering those either through work assignments, city repair, contract services, or reimbursement to the contractor. • The Division’s financial staff receives the monthly payments from the contractor and is responsible for reviewing and auditing both the payments and the underlying payment basis; also receives payments for special zone allocations and meter bagging. • The Meter Section maintains the parking meters and is responsible for meter collection; typically collection is performed every four days in high volume areas and once a week in lower volume areas. • The Division receives, reviews, and makes recommendations to the Traffic and Parking Commission on all requests for designations of loading zones, valet parking zones, bus zones, taxi stands, residential parking restrictions. • Both the Police Department and the Parking Division issues parking tickets. • The Citation system is completely manual; the Department is interested in considering an automated system, but the Police want both departments to switch at the same time. • Parking meter enforcement is performed by six Corrections Officers assigned by the Sheriff; the officers are new persons who spend six months on this duty before being assigned to the detention center. 	<ul style="list-style-type: none"> • Over the period from Oct. 2000 to Sept 2001, net income for parking garages and lots was \$1,006,767 • Over the same period, meter revenue was \$910,445 and meter bag revenue was \$35,696. • The Division maintained 1,612 meters in November 2001, up from 1,511 for November 2000. • In November 2001, the Parking Meter Division conducted 163 prevention maintenance repairs, responded to 62 trouble calls, repaired 10 meter posts, painted 94 meter posts, and installed 19 signs • The meter enforcement division averages approximately 5,500 citations per month • Meter Repair and Collections personnel work on a 7:00 a.m. to 3:30 p.m., Monday through Friday schedule. • Corrections Officers work on a 7:30 to 4:00 Monday through Friday schedule, with 2 persons also working a 7:30 to 12:30 shift on Saturdays.

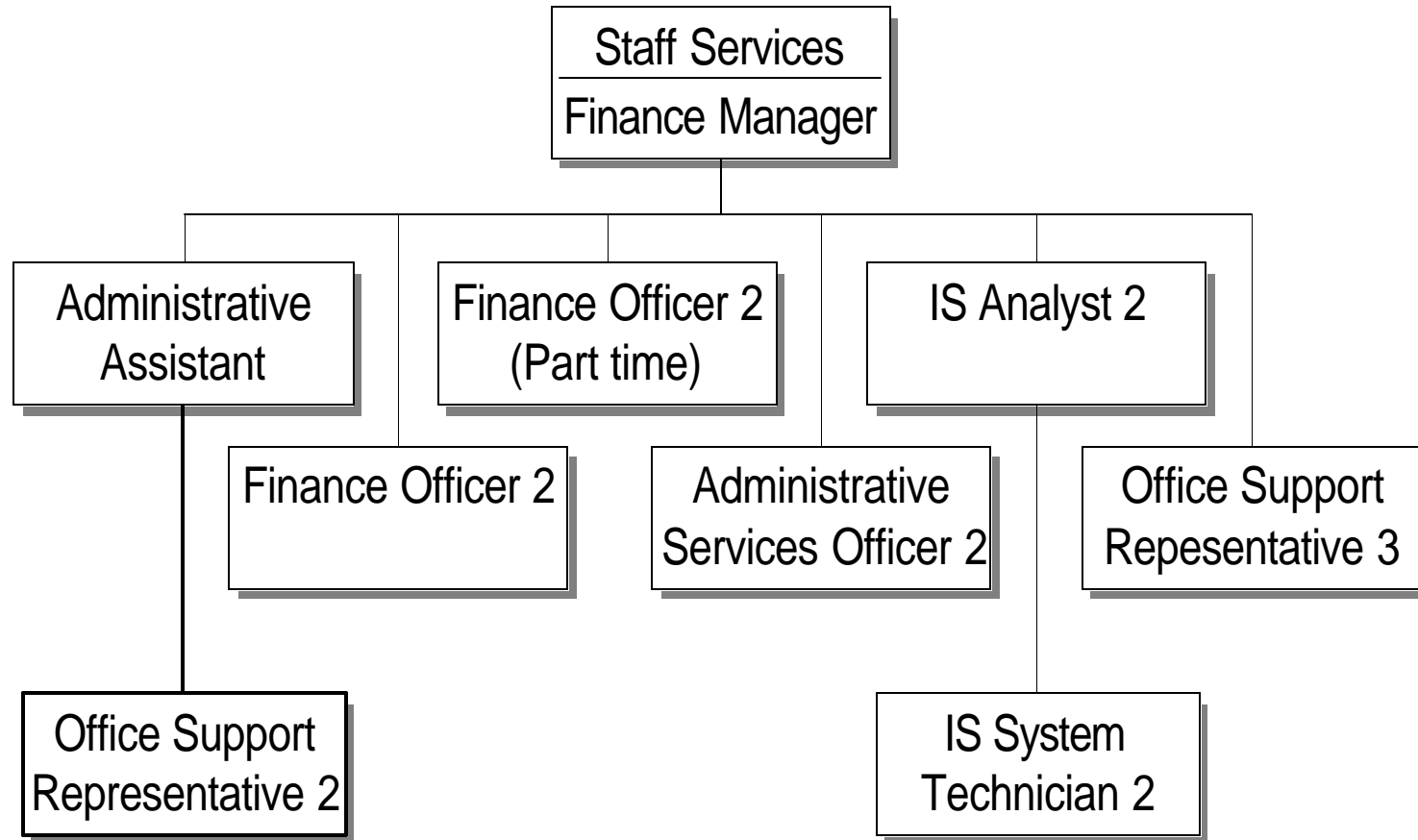
Function	Description of Services	Workload and Service Levels
Engineering Administration	<ul style="list-style-type: none"> • Communicates Division requirements and activities to the Mayor as well as to Council. • Establish goals/strategies for the Division and each section. 	
Traffic Engineering	<ul style="list-style-type: none"> • Conduct studies regarding installation/modification of traffic control devices in response to requests from the public (i.e., requests for stop signs, traffic signals, speed limit changes, four-way stops, etc.). • Review development submittals (subdivision plats, commercial and industrial building permits) referred by the Planning Department and Code Enforcement Department. Review the associated traffic impact studies, proposed mitigation measures, site layout, and attend Planning Commission meetings. • Design traffic signals for road widening or modifications to existing signals. • Conduct modification studies of traffic signals such as signal timing, loops, programming, etc. • Conduct traffic counts using eight new traffic counters. These are computer-based traffic counters. 	<ul style="list-style-type: none"> • Complete approximately 1,200 traffic studies annually with an approximate two to three week response time to these requests.
Capital Projects Management	<ul style="list-style-type: none"> • Manage the design and construction of capital improvement projects • Provide construction inspection of the sidewalk capital improvement projects to assure adherence to the plans, specifications, and estimates. • Provide design and construction staking survey services. Use total station survey equipment. • Plan check of commercial and industrial building permit submittals to assure public improvements adhere to standard details. • Provide street addresses and names for new development after the plat is recorded. Utilize the Land Information System to 	<ul style="list-style-type: none"> • A six year total of \$790.3 million of capital improvement projects are included within Public Works G.S.D. in the six year capital improvement budget and another \$250.0 million in Public Works U.S.D. in the six year capital improvement budget • The survey crew apparently provides a timely response to requests for survey, with a two-week turnaround time to such requests. Contract survey crews are seldom utilized.

Function	Description of Services	Workload and Service Levels
	<p>maintain the street name index.</p> <ul style="list-style-type: none"> • Microfilm plans including plat grading and drainage plans, and plat construction plans. • Maintain the Street and Alley index. Index of streets and alleys owned and maintained by Metro Nashville. Update with new streets and alleys resulting from development. • Maintain the E-911 database, inputting new addresses, on behalf of utilities, U.S. Post Office, and public safety services. 	
<p>Excavation, Encroachment, and Street Closure Permits</p>	<ul style="list-style-type: none"> • Issue street closure, excavation, and encroachment permits. • Inspect excavation cuts, both the backfill and the final, inspect encroachment permits, and inspect street closures for barricading and warning signs. • Completes the plan checks for commercial and industrial building permits for handicap ramps, curbs, sidewalks, and driveways and assure these improvements are built according to standard details. 	<ul style="list-style-type: none"> • This section issued 6,561 street closure permits, 974 excavation permits, and 9 encroachment permits in calendar year 2001.
<p>Storm Water Services</p>	<ul style="list-style-type: none"> • Inspect the construction of public improvements resulting from development including plats and commercial/industrial permits. This includes streets, sidewalks, drainage, curb and gutter, driveways in the right of way, storm drains, detention ponds, and grading. • Plan check preliminary/final plats and construction plans. • Provides engineering review for building permits. 	<ul style="list-style-type: none"> • There are approximately 130 active subdivisions and 240 active commercial/industrial building permits.
<p>NPDES (Note: The NPDES function was transferred to the Water Department during the period of this study.)</p>	<ul style="list-style-type: none"> • Improve the water quality of receiving streams in Metro Nashville. • Conduct a field screening program to identify non-storm water discharges into the storm water collection system and identify their sources. The major outfalls must be field screened once every two years. An “outfall” includes such items as outfalls from a piped storm water conveyance as well as ditches or other channels. These two staff collect storm water samples in the 	<ul style="list-style-type: none"> • Notices of Violation sent in calendar year 2000: 47 • Notices of Violation sent in calendar year 2000 for grading permits: 5 • Field screening program has evaluated an estimated 4,274 major outfalls over the past two years. Only 139 sites were found to have storm water flow.

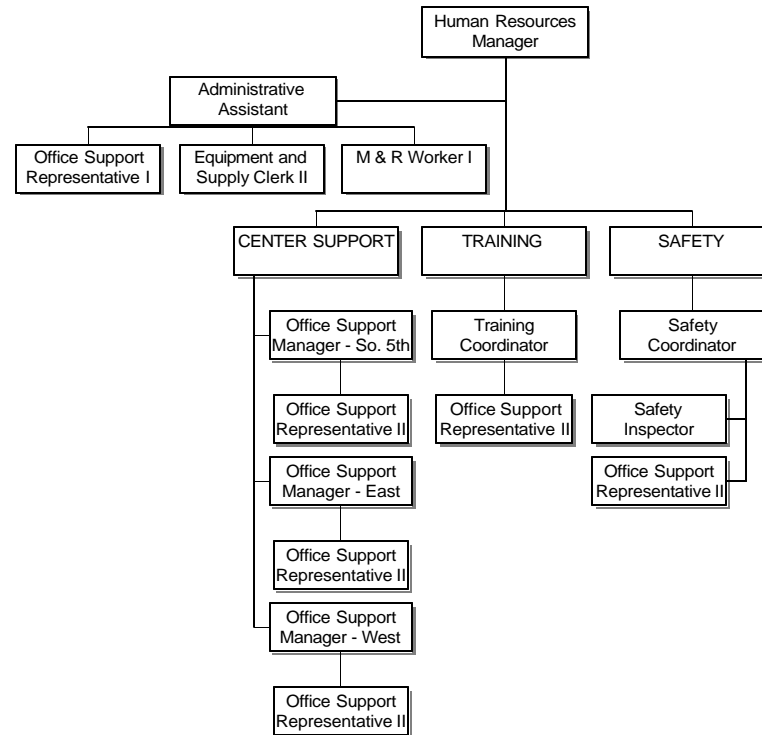
Function	Description of Services	Workload and Service Levels
	<p>field. Use a small lab kit to test for pH, dissolved oxygen, TR chlorine, total copper, total phenol, detergents, ammonia, fluoride, temperature. Attempting to identify illegal discharges into the storm water system. Didn't find that many illegal discharges; recommending a modification for the next five year permit to reduce the extent of sampling for the rural areas of Metro Nashville.</p> <ul style="list-style-type: none"> • Conduct an ambient stream monitoring program collecting regular grab samples from established points in streams and assessing the biology and stability of selected streams. Ambient monitoring focuses on specific locations where the sample is taken at the same time on the same day, every month. The intent is to build a baseline of data regarding storm water at these locations. • Conduct inspections of high-risk industrial facilities, as required by the five-year permit, to monitor and control pollutants in storm water runoff. The goal of the initial inspection is to determine if chemicals present at the industry are utilized, stored, moved, disposed of, etc. in a manner that can contribute to storm water pollution. Sampling of runoff will be conducted (foam, odor, stains, etc. visible at the outfall). Storm water monitoring is conducted both via automatic sampling devices and manual sampling techniques. 	<ul style="list-style-type: none"> • Ambient stream monitoring at eight locations. • Conduct inspections of approximately 74 high-risk industrial facilities.
Intelligent Transportation System		<ul style="list-style-type: none"> • The Engineering Division has obtained \$16,526,028 in grants from the federal government for the implementation of an Intelligent Transportation System. The local match for these grants amounts to \$1,368,991. This includes eleven separate capital improvement projects.

ORGANIZATION CHARTS

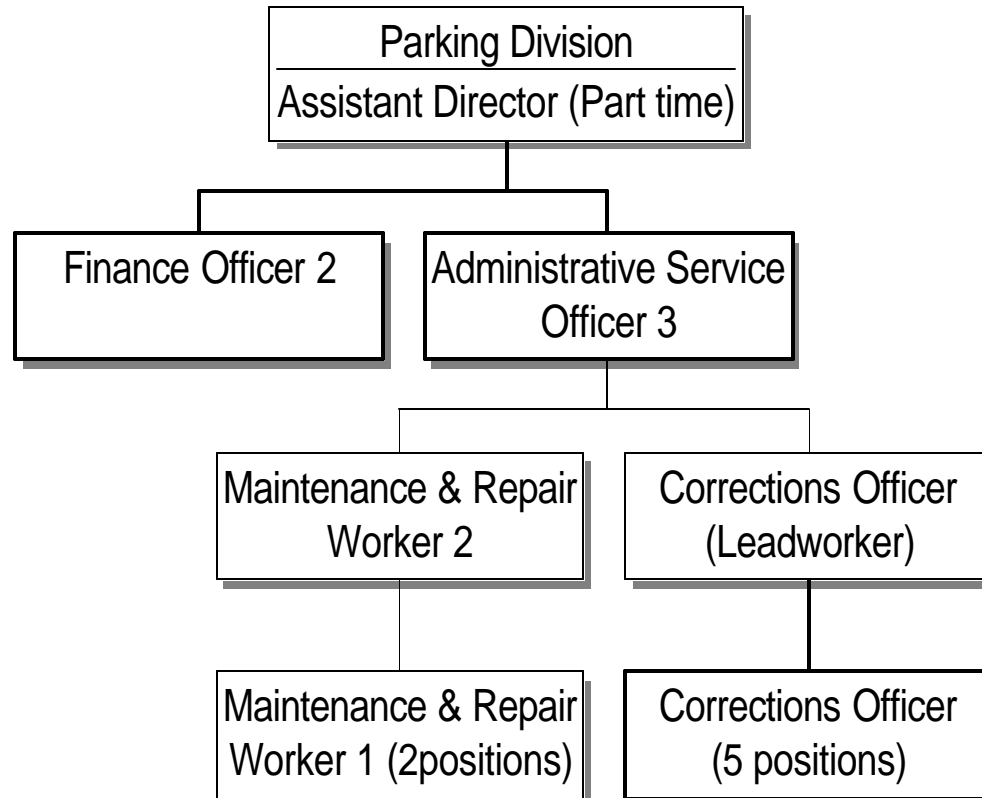
STAFF SERVICES: FINANCE



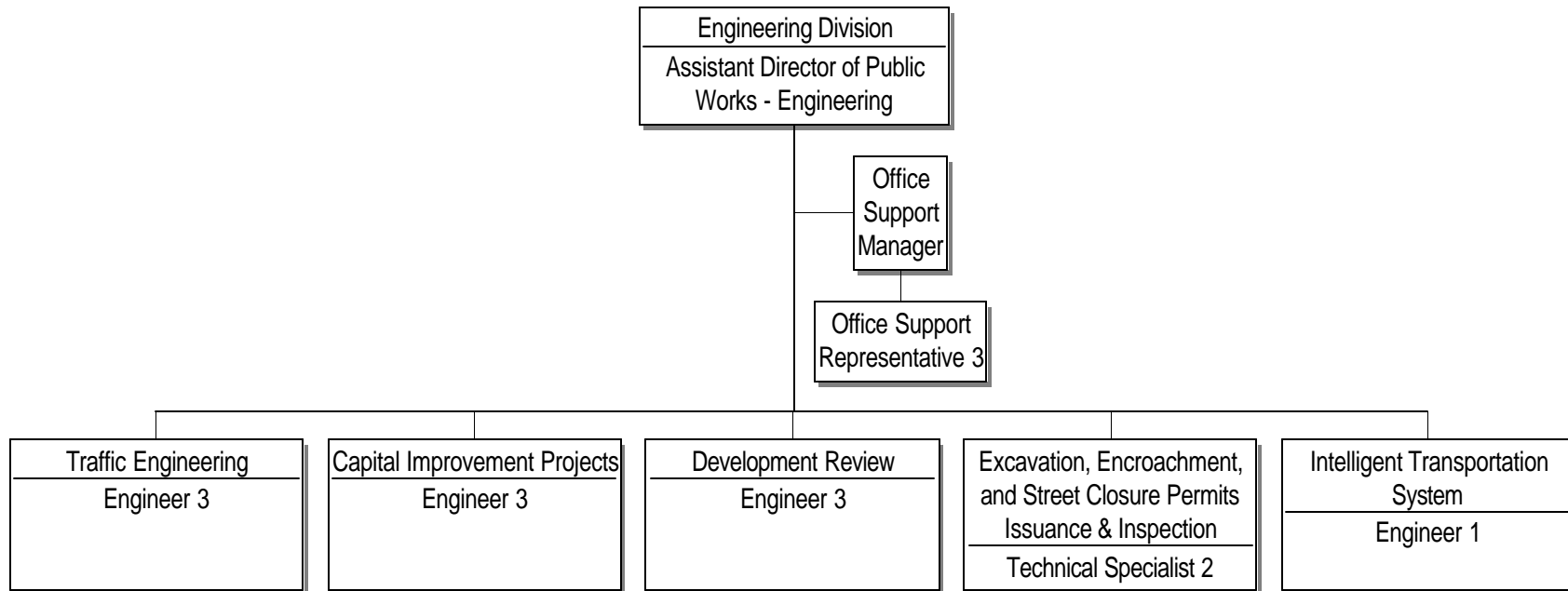
STAFF SERVICES: HUMAN RESOURCES



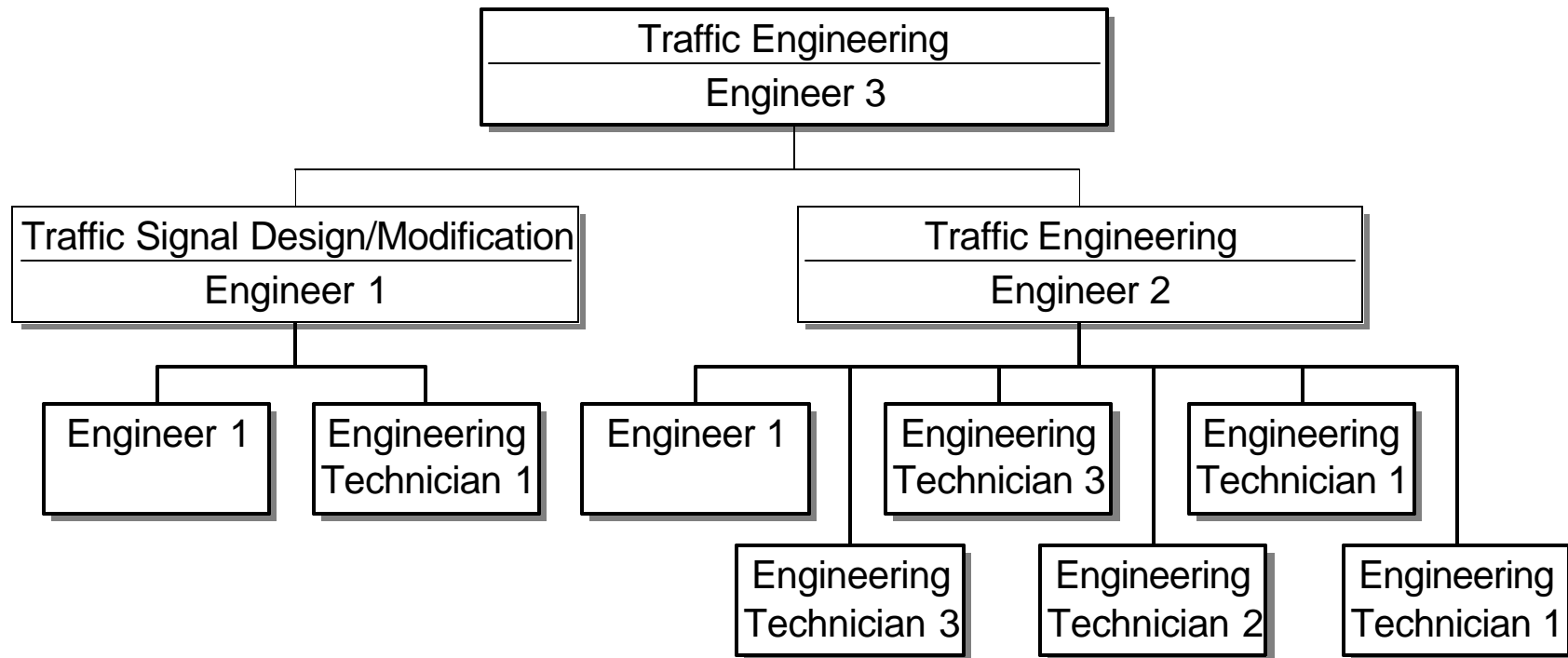
PARKING DIVISION



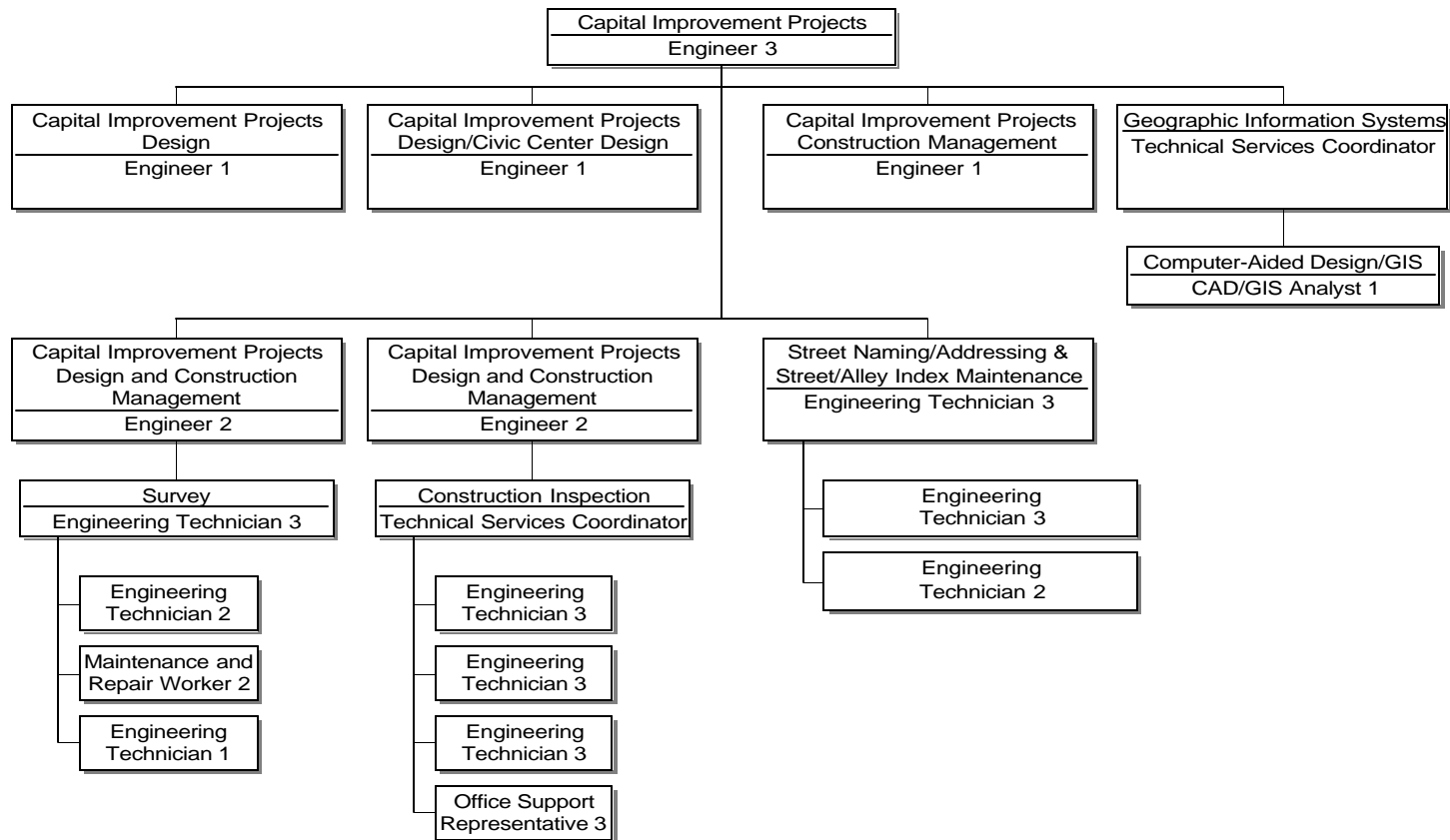
ENGINEERING DIVISION ADMINISTRATION



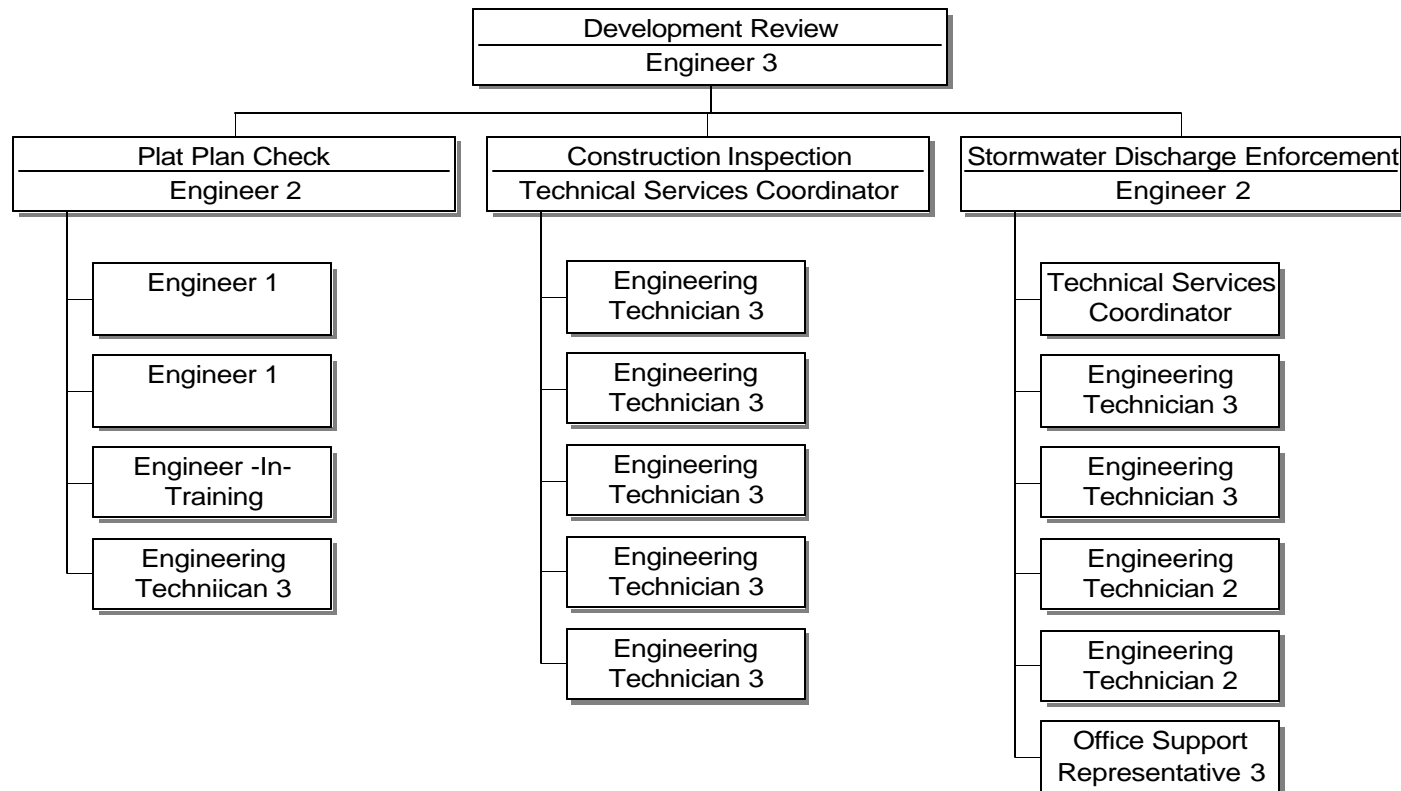
ENGINEERING DIVISION: TRAFFIC ENGINEERING



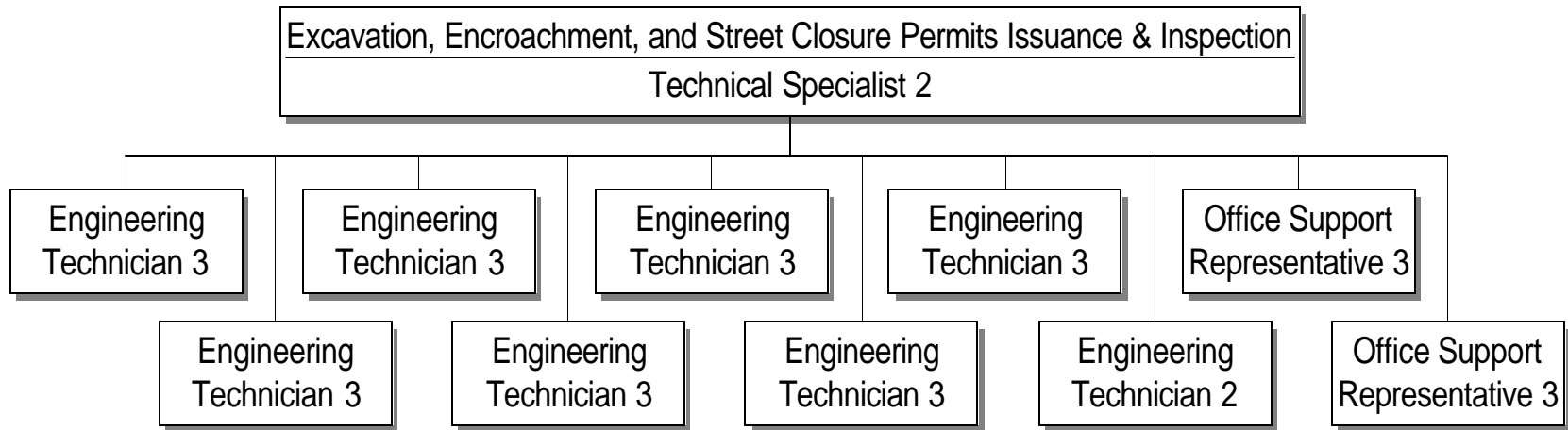
ENGINEERING DIVISION: CAPITAL PROJECTS MANAGEMENT



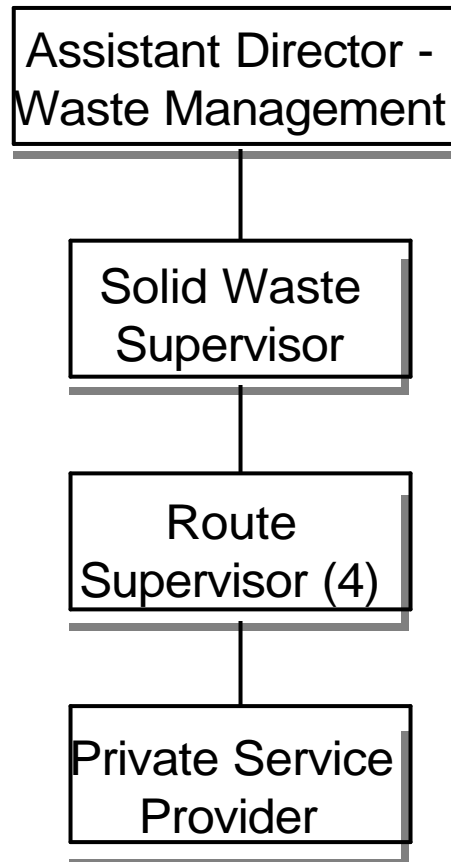
ENGINEERING DIVISION: DEVELOPMENT REVIEW



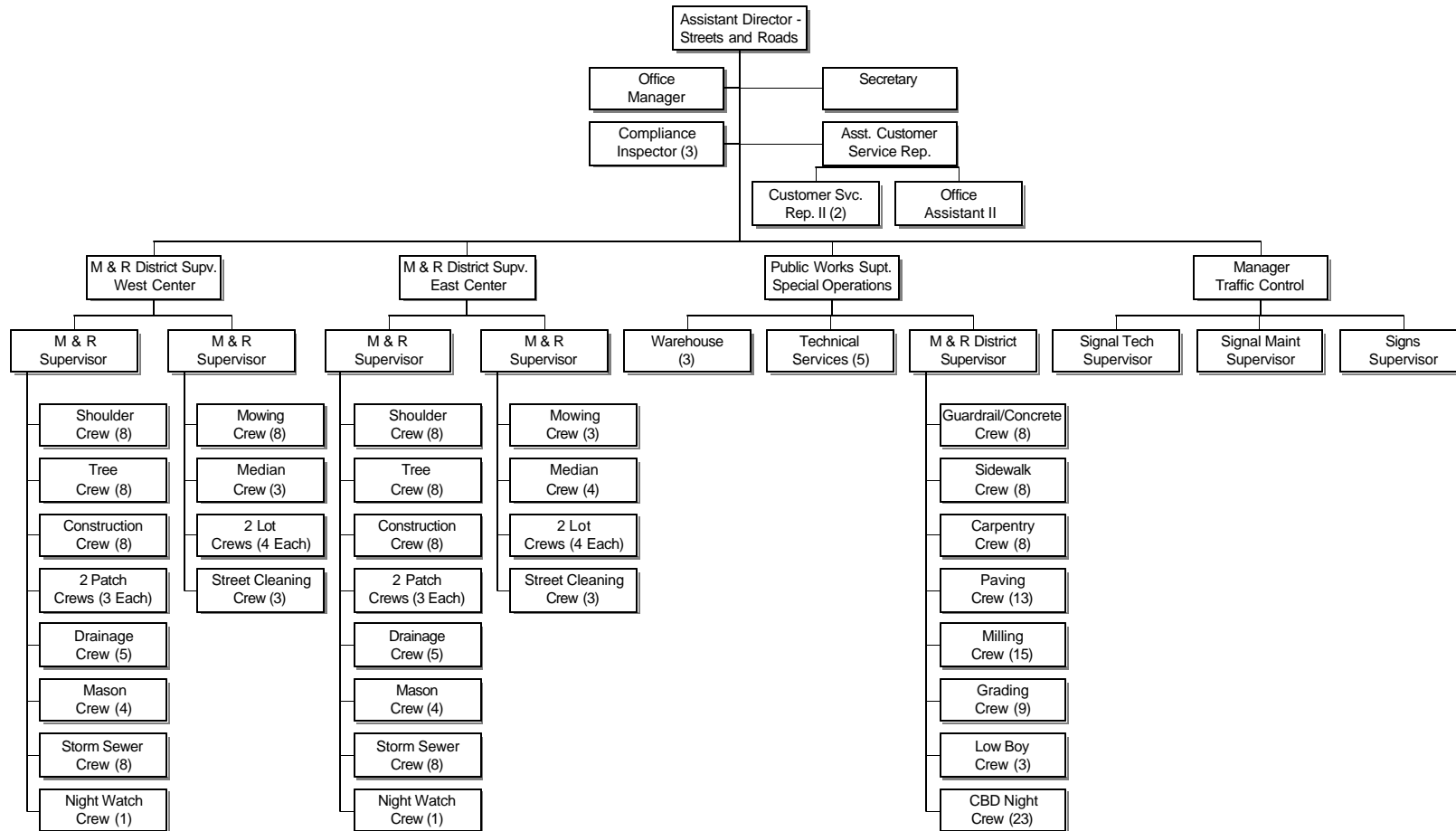
ENGINEERING DIVISION: EXCAVATION, ENCROACHMENT, AND STREET CLOSURE PERMITS



WASTE MANAGEMENT DIVISION: CHIPPER SERVICES



STREETS AND ROADS DIVISION



ATTACHMENT B
BEST MANAGEMENT PRACTICES ANALYSIS
METROPOLITAN NASHVILLE AND DAVIDSON COUNTY
PUBLIC WORKS DEPARTMENT

Beginning on the following page, we have identified various industry best practice standards that are applicable to the Nashville Department of Public Works. MAXIMUS project staff selected the best management practices and identified what we perceived to be departmental strengths based on our interviews, field observations and data collection. The Department reviewed the report and provided additional input concerning various operations. We have included those in this analysis document.

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements
<p>Existence of formal work planning and scheduling system.</p>	<p>The Streets and Roads Division formally plans for the paving of streets in Metro, as these are contracted out to 4 contractors. Similarly, traffic signal installations, CBD street sweeping and other contracted services are planned and scheduled.</p> <p>The division plans and schedules “scheduled services”. These include:</p> <ul style="list-style-type: none"> - Street Sweeping Countywide - Street Cleaning C.B.D. - Roadside Mowing - Median Mowing - Litter Pickup - Litter Receptacle Route service - R/W Trimming <p>All “projects” performed by the division (e.g. paving, milling, traffic signal installations, and other const.) are scheduled so as to coordinate with other utilities, projects, and to ensure public notification.</p> <p>All “requested services” are scheduled (projected start and completion dates).</p>	<p>Beyond the routine contractual services noted at left, the Division does not engage in formal planning of annual activities. Although many of these activities are reactive in nature (e.g., lot clean-up, shoulder repair, sidewalk repair, milling, etc.), data exist (although not in readily-accessible formats) to determine the probable numbers of requests, associated person hours, as well as workload measures, to allow the Division to project the activities in which it will engage in the upcoming year. These should be projected in order to develop service level “targets”, and to provide Departmental and Metro management with accountability measures for the Division.</p>

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements
<p>Time tracking information is available in sufficient detail to allow analysis of work practices.</p>	<p>Streets and Roads (both in the maintenance and traffic control sections) reports workloads and activities at a depth of detail sufficient to develop and analyze costs sufficient for managers to make informed decisions regarding probable workloads by month, equipment usage, etc.</p>	<p>The current information system, CostSum, is used to accumulate direct costs of projects, as well as the “cost” of equipment usage. However, this information is not being analyzed by management, and it is not combined with workload metrics to enable unit costs. In addition to the fact that it is not analyzed, the project team questions the value of the information in the form in which it is captured. For example, capturing costs by project does not provide a meaningful historical measure, as costs may be expected to increase over time. Further, the reported equipment costs do not appear to be based on actual cost calculations, as interviews indicate that these costs have been in effect for many years.</p>
<p>Formal pavement management system (PMS) in place.</p>	<p>This is a relative strength of the Division. The Technical Services Section of Streets and Roads, through contract with IMS, rates road conditions and performs “what if” scenarios relating to probable road conditions given various levels of paving expenditures.</p>	<p>The process of notifying the Technical Services Section of road sections damaged and repaired through utility cuts should be modified.</p>

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements
Annual inspection of all roads.	The Technical Services Section, through IMS, inspects Metro roads on a 5-year cycle. In 1993, all roads were reportedly graded to establish a base line.	
Existence of concrete/sidewalk inspection program.	The concrete inspection program is currently being performed by a private contractor.	It is unclear through interviews whether this program will be continued and carried out through Streets and Roads on a periodic basis. There should be both formal and informal approaches to concrete inspections which ensure an annual inspection of all segments.
Streets are resurfaced on a cycle of 5% - 8% of the system per year.	The Division reportedly repaved 110 of 2,154 center line miles of road in 2001, equating to 5.1% of the inventory. This is at the low end of the "acceptable" range.	Metro has recently significantly increased the budgeted expenditures for repaving streets and roads, as well as for installing and repairing concrete sidewalks. This increased expenditure level will place a far greater demand upon the Department in coordinating work with outside agencies such as utilities and contractors, and will necessitate greater resources in project management.

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements
Major road repairs and reconstruction contracted out.	The Streets and Roads Division contracts out most road paving, although it maintains a paving crew for street segments which are of lengths which contractors are reportedly uninterested in paving. In addition, the Division maintains a milling crew which performs almost all milling in Metro. These functions will be further analyzed by the project team to determine cost effectiveness and efficiency.	
Catch basins are cleaned on a 2 year cycle.	There is a complete inventory of all catch basins countywide outside the CSO areas. This is the area that Public Works was responsible for maintaining. This inventory is available on G.I.S.	There is no targeted service level for ensuring the periodic cleaning of catch basins in Metro. The responsibility for this function was transferred to Water Services in April.

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements
Evaluation of contracting conducted in other areas of road maintenance.	<p>The Department has contracts with 4 asphalt paving contractors to perform paving of Metro roads. These contracts are primarily in areas containing longer road segments. The Department paves many roads with an in-house crew.</p> <p>The Department also contracts for chipper service, street sweeping in the Central Business District, traffic signal installation, street markings and other services on a selected basis.</p>	The project team will continue to analyze the cost effectiveness of other functions performed in-house, such as road milling, concrete installation, mowing, etc. Further, the project team will continue to analyze services currently performed on contract which may be more cost-effectively performed in house.
Existence of sign inventory.		The Signs and Markings unit of Traffic Control maintains a manual record of signs, however this is not automated, and cannot provide immediate access to the maintenance history or exact location of each sign in inventory.
Annual inspection of sign reflectivity.		Sign reflectivity is checked as Technicians and other Metro employees are in areas of signs. There is, however, no defined practice or methodology for ensuring each Metro sign is checked on an annual basis.

STREETS AND ROADS		
Best Management Practice	Strengths	Potential Improvements
Annual painting of school cross walks.	This is accomplished on contract. Interviews indicate that these are done annually.	
Bi-annual painting of other cross walks.	This is accomplished on contract. Interviews indicate that these are done annually.	
Legends repainted: <ul style="list-style-type: none"> - Arterials: 12 months. - Collectors: 18 months. - Residential: 24 months. 	The Signs and Markings unit of Traffic Control annually identifies all road segments which have pavement index ratings over 72 (as those under 72 are candidates for repaving), and performs physical examination of these street segments to determine which should be re-striped. Interviews indicate that Metro complies with the targeted levels, at left.	
One Signal Technician per 30 to 35 signalized intersections.		With approximately 800 signalized intersections, and 12 field Traffic Technicians, the ratio is about 67:1.
Signal operability targeted at 99% or above.		The Traffic Control section does not monitor signal operability. Interviews indicate, however, that a large percentage of signals is aging and includes poor cabling, plastic housing, etc., which are causing excessive maintenance problems.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
ENGINEERING ADMINISTRATION		
The engineering organization is centralized to capture economies of scale.		The engineering staff resources to support the water and wastewater utility are decentralized. The Water Resources Department has 54 Engineering Technician's, 9 Engineers (1, 2 or 3), and 7 CAD/GIS Analysts. Pavement management is assigned to the Streets and Roads Division, not the Engineering Division.
The engineering organization allows for functional decentralization in order to meet unique customer needs.	An Engineer 1 has been physically based at the Code Enforcement Department to provide engineering review for building permits.	Other Engineering Division development services staff are based at their offices at 720 S. Fifth Street, and not at the offices of the Planning Organization. This includes both traffic engineering staff and development services staff.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
<p>A formal business plan has been prepared for the Engineering Division to identify priorities, challenges, risks, and competitive issues – and to develop goals, objectives and performance measures to address problem areas.</p>		<p>A formal business plan needs to be prepared for both Engineering and the Department to provide clear goals, objectives, and performance measures. The annual operating budget does not provide such clear goals, objectives, and performance measures for the Engineering Division.</p>
<p>Policies and procedures for the Engineering Division are well documented.</p>	<p>The Capital Projects Section has begun to develop capital project management procedures.</p> <p>We have approx. 35 written policies for traffic, permits, and capital projects, and are in the process of developing other procedures.</p>	<p>The procedures being developed by the Capital Projects Section are in their infancy. Other sections have not yet developed such policies and procedures.</p>

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
<p>A long-term information technology plan has been prepared for the Engineering Division.</p>		<p>A long-term information technology plan needs to be prepared to provide direction for the development of technology within the Engineering Division. While some areas of the division are utilizing technology to enhance productivity (e.g., Capital Improvement Projects), others are not (e.g., survey crew).</p>
TRAFFIC ENGINEERING		
<p>A transportation master plan has been developed.</p>	<p>The Metropolitan Planning Organization has developed a transportation master plan for the five county region. Arterial streets are the focus.</p>	
<p>Existing level of service is known for arterial and collector streets identifying the performance of the street in terms of traffic congestion and travel time delay.</p>	<p>The staff indicates that it routinely calculates the level of service of intersections on an as-needed basis.</p>	<p>The Traffic Engineering Section relies primarily on other agencies or consulting engineers on behalf of developers or the Engineering Division to develop such levels of service other than on an on-call basis; the Department's planning efforts should institutionalize this information gathering.</p>

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Traffic counts are routinely conducted for arterial and collector streets.	<p>TDOT collects traffic counts for major streets.</p> <p>An Engineering Technician I is allocated to traffic counts.</p>	<p>The Traffic Engineering Section doesn't have a traffic count updating program or schedule. Traffic counts are not routinely collected for collectors.</p> <p>Only eight of the new computer-based traffic counters are available.</p>
A computer-based traffic-forecasting model is utilized to assess the trips generated by development, model different land-use options, develop long-term forecasts of traffic, and the benefits of mitigation measures.	The Metropolitan Planning Organization has developed a computer-based traffic-forecasting model.	The Traffic Engineering Section lacks such a computer model. The section relies on consulting engineers working on behalf of developers to identify the number of trips generated.
A traffic safety program is in place to proactively identify high accident intersections and develop mitigation measures.	<p>A consulting firm conducted detailed site investigations, identified the thirty highest accident intersections, and developed recommended solutions.</p> <p>The Engineering Division is working with the Police Department to develop a real-time basis for accident reporting, and develop an in-house capacity for traffic accident analysis.</p>	The Traffic Engineering Section is largely reactive, and relies on consultants for proactive traffic engineering services.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
<p>A traffic improvement program is in place to design and implement traffic system management measures to maximize existing street system traffic capacity and reduce traffic congestion and travel time delay</p>	<p>The 50 most congested intersections in Metro Nashville have been evaluated by the Department or a consulting firm and improvements identified to reduce congestion. The Division has selected five intersections to address; the improvements at these five intersections are funded through CMAC and TIP. In the next year or two, funding for the remaining five intersections the remaining five will be addressed.</p>	<p>The Traffic Engineering Section is largely reactive, and relies on consultants for proactive traffic engineering services. 90% of traffic signal rephasing is based upon citizen complaints.</p> <p>There is not an in-house staff capacity to evaluate congested intersections and identify improvements. The Traffic Engineering Section is largely reactive, and relies on consultants for proactive traffic engineering services.</p> <p>Only 50 intersections have been evaluated out of a possible 700 intersections.</p>
<p>A computer-based traffic signal system is in place that adjusts the timing of signals on a real-time basis and provides the automated flexibility to change the timing of signals in response to both daily and seasonal traffic patterns (e.g., Tennessee Titans games).</p>	<p>The Engineering Division has been successful in obtaining grants to construct an Intelligent Transportation System. Total funding, including the local match, amounts to approximately \$17.9 million.</p>	

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
A traffic mitigation fee has been developed and adopted based upon a comprehensive transportation master plan that identifies deficiencies in the street network, weaknesses in the traffic control system, etc.	The Metropolitan Planning Organization is developing a financial strategy for the five county region.	
A citizen request system responds to requests in a timely fashion and maintains automated records to avoid restudying the same problem.	The Traffic Engineering Section responds to citizen requests typically within two to three weeks. An automated database is maintained for these accidents.	
Traffic control improvements (i.e., stop signs, red curbing for line-of-sight, etc.) are identified and studied proactively by staff rather than responding solely to citizen requests.		The Traffic Engineering Section is largely reactive to citizen requests, and relies on consultants for proactive traffic engineering services.
Opportunities to improve pedestrian safety and bicycle safety are proactively investigated and measures developed and implemented to address these needs.	A consulting firm is in the beginning stages of the development of a bike and pedestrian master plan. The master plan is scheduled to be completed in June.	The Traffic Engineering Section is largely reactive to citizen requests, and relies on consultants for proactive traffic engineering services.
The extent of staff assigned to signal design and inspection is based upon cost of construction guidelines.		Cost of construction guidelines are not utilized.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Effective project management techniques are utilized for signal design and inspection capital improvement projects.		Effective project management techniques are not utilized. Some staff within the Traffic Engineering Section are ineffectively utilized.
The extent of traffic engineering professional and technician staffing is comparable to the range identified in the 1995 report issued by the Institute of Transportation Engineers: <i>Status and Effectiveness of Urban Traffic Engineering Agencies</i> .		There are a total of eleven traffic-engineering professionals and technicians within the Engineering Division or 1.9 staff per 100,000 population. This is comparable to the lower end of the range of other agencies in the 1995 report. The average for the twenty-nine agencies with a population of 250,000 or more was 6.7 staff per 100,000 population or three and one-half times greater than Metro Nashville.
STREET CLOSURE, EXCAVATION, AND ENCROACHMENT PERMITS		
Full-time staff are dedicated to the issuance and inspection of street closure, excavation, and encroachment permits.	The Engineering Division devotes full-time staff to street closure, excavation, and encroachment permits.	It is unclear that eleven staff are required to effectively administer this program.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Inspections are formally documented on a written inspection form. Automated records are maintained of these inspections and safety violations.		Inspections are not formally documented.
Contractors are required to submit proof that their first level supervisors have been trained in work zone safety.	The employees of the barricade contractor utilized by most construction contractors – Blinker Light Safety – have been certified.	Minor contractors are not required to submit proof that their first level supervisors have been trained in work zone safety.
A traffic control plan must be submitted for the issuance of street closure permits.	Traffic control plans are plan checked for proposed signage, traffic flow, etc.	
Fees are charged for the issuance and inspection of street closure, excavation, and encroachment permits to fully recover the Metro Nashville’s cost of administration	Fees are collected for issuance and inspection of excavation permits.	While a fee schedule was adopted for street closure permits in 1997, the Department has not begun collecting those fees.
A systematic approach has been developed for inspection of street closure, excavation, and encroachment permits.	Inspectors are assigned to districts. Inspectors inspect the street closures for major thoroughfares focusing on the first day of the lane closure, and then every two or three days after that. Excavations (or utility cuts) are inspected at the front end for lane closure, at backfill at temporary patch, and for permanent patch.	Other than the major thoroughfares, other street closures are inspected on a complaint-basis.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Requests for street closure, excavation, or encroachment permits may be submitted by customers on-line or by fax.		This capacity has not yet been developed.
Requirements for issuance of street closure, excavation, or encroachment permits are available at the Engineering Division's web site.		These requirements are not available at the Engineering Division's web site. The Department should consider expanding the site both to include the requirements and to enable customers to apply for and receive permits on-line.
Engineering Technicians conduct thirteen to fifteen inspections per day.		Data regarding the number of inspections is not routinely collected. The Technical Specialist 2 is collecting a "snapshot" for MAXIMUS.
The regulations regarding issuance of street closure, excavation, or encroachment permits apply to all utilities including those owned by Metro Nashville.	All utilities must meet these regulations, including those utilities owned by Metro Nashville.	
An automated system of tracking issuance of street closure, excavation, or encroachment permits is utilized.	The Land Information System is utilized to track the issuance of street closure, excavation, or encroachment permits.	It is difficult to obtain reports from the mainframe based system.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
CAPITAL PROJECTS MANAGEMENT		
A five-year capital improvement program has been developed by Metro Nashville and adopted by the City Council.	A five-year capital improvement program has been developed by Metro Nashville.	
The five-year capital improvement program for the Engineering Division clearly identifies the goals, priorities, and expected outcomes of the program within the context of <i>Managing for Results</i> .		The goals, priorities, and expected outcomes of the capital improvement projects assigned to the Engineering Division are not defined.
Staffing requirements for the all of the capital projects in the first year of the five-year capital improvement program have been identified.		Staffing requirements for all of the capital projects in the first year of the five-year capital improvement program have not been identified.
Staffing for design and inspection of capital projects is based upon cost of construction guidelines.	Cost of construction guidelines appear to be used to determine budgets for engineering and inspection services.	
An appropriate mix of in-house staff and consulting engineers are utilized for the design and inspection of capital improvement projects based upon the expertise required and the continuity of the workload.	Consulting engineers are being utilized for roadway and bridge design and construction inspection.	Consulting engineers and inspection staff are being utilized for capital projects that could be accomplished with in-house staff (e.g., use of USI Infrastructure for sidewalk construction inspection).

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Staff resources are allocated to fit the design and inspection workload to the available resources.		Staff resources are not allocated to fit the design and inspection workload to the available resources.
“Billability” targets have been set for engineering staff for the design and inspection of capital improvement projects and management monitors their success in meeting these guidelines.		“Billability” targets have not been set for engineering staff for the design and inspection of capital improvement projects
A Gantt chart schedule has been developed for capital improvement projects for a two to three year period.	The Division uses Microsoft Project for project scheduling activity.	A Gantt chart schedule has not been developed for capital improvement projects for a two to three year period.
There are clear, easily read capital improvement program and project status reports that match the level of detail needed by the expected audience.		There are not clear, easily read capital improvement program and project status reports.
A project cost accounting system is utilized to enable comparisons of planned versus actual staff hours for the design and inspection of capital projects.		A project cost accounting system is not utilized.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Capital projects are scoped and cost estimates developed before the commencement of design.		Capital projects are not scoped and cost estimates developed before the commencement of design.
Project managers have access to the Metro Nashville automated financial management system to monitor the actual versus planned design, inspection, and construction costs for capital projects.		Project managers do not have access to the Metro Nashville automated financial management system.
Feedback mechanisms (e.g., final report) have been developed at the completion of capital improvement projects to enhance learning and correction of problems.		Feedback mechanisms (e.g., final report) have not been developed.
A team approach is utilized in the approach to design in which engineers and engineering technicians are organized into teams with each team having responsibility for certain types of projects (i.e., bridges, streets, etc.).		A team approach is not utilized.
A single manager is assigned to the management of the design, construction inspection, and construction management of capital improvement projects.	A single manager – an Engineer 3 – is assigned to the management of the Division’s capital improvement program.	

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Project managers are responsible for capital improvement projects from “cradle to grave”, with responsibility for project development, design, construction inspection, construction management, and closeout.		Project managers are not responsible for capital improvement projects from “cradle to grave”.
Experienced and qualified project managers are utilized for project management.	The Engineering Division has experienced and qualified project managers.	
Performance measures have been developed for project management that include components regarding scheduling, budgeting, scoping, and quality of capital improvement projects.		Performance measures have not been developed for project management.
A project management procedures manual has been developed. The manual should define, at a minimum, a communication plan; project management and reporting processes for monitoring scope, schedule and budget; processes for handling change orders, claims, and project issues; and document management.		A project management procedures manual has not been developed.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Well-developed change order control procedures are in place.		While the Department uses change order processes as established by Metro standards, the management of the change order process could be enhanced by improved documentation maintained in a central data system.
An automated project management system has been acquired, and all of the engineering staff have been trained in and utilize the system.	The Division uses Microsoft Project, which is a base level project management tool.	The scope of project management needs to be greatly expanded, including improvements to project documentation
AutoCAD and other productivity enhancing design tools are utilized.	Some engineering staff utilize AutoCAD Map 2002 and Eaglepoint to enhance their productivity.	A mix of professional engineers and engineering technicians are not utilized for design, with the engineering technicians performing the technical design work utilizing AutoCAD Map 2002 and Eaglepoint.
30%/60%/90% reviews of the design of capital improvement projects are conducted by construction inspectors.		30%/60%/90% reviews of the design of capital improvement projects are not conducted by construction inspectors.
A standard project documentation system is in place for each project under construction to mitigate the risks associated with claims.		A standard project documentation system is not in place.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Prior to commencement of the construction phase, a detailed structure for the document management file index system is developed.		A detailed structure for the document management file index system is not developed prior to construction.
Engineering Technicians utilize automated input devices to record inspection results or display inspection history while in the field.		Automated input devices are not utilized.
The survey crew utilizes robotic survey equipment to enhance their productivity.		The survey crew utilizes total station equipment, and not robotic survey equipment. Despite using total station equipment, a three-person crew size is utilized.
DEVELOPMENT SERVICES		
An automated voice-activated inspection request system is utilized to receive inspection requests with linkage to the automated permit information system.		An automated voice-activated inspection request system is not utilized.
Engineering Technicians utilize automated input devices to record inspection results or display inspection history while in the field.		Automated input devices are not utilized.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
An Engineering Technician responds to inspection requests within one workday of the receipt of the request.	Engineering Technicians respond to inspection requests within one workday.	
Plat map plan checking and building permit plan checking is accomplished concurrently by all of the departments involved in the process.	Plat maps that involve multiple departments are plan checked concurrently. Building permits are checked concurrently.	
Turnaround times for first plan check of plat maps are responsive.	The Planning Commission has established a twenty-eight-calendar day turnaround time for processing preliminary and final plat maps.	
A “one stop” system exists for submittal of development service applications. Applicants do not have to walk or drive their submittal from department-to-department.	An Engineer 1 has been physically based at the Code Enforcement Department to provide engineering review for building permits.	Other Engineering Division development services staff are based at their offices at 720 S. Fifth Street, and not at the offices of the Planning Organization. This includes both traffic engineering staff and development services staff.
An automated case management system has been developed and installed in all departments in Metro Nashville to manage the length of time required for development services..	The Land Information System is utilized to track the issuance of development-related permits.	It is difficult to obtain reports from the mainframe-based system.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
The costs of plan checking plat maps are fully recovered though development fees.		Fees to recover the costs of the development services provided by the Engineering Division have not been adopted.
Inspection of public improvements (i.e., streets, sidewalks, curb and gutters, etc.) resulting from the development of subdivisions or from commercial or industrial building permits for conformance with standard details or specifications has been centralized.	Inspection of public improvements (i.e., streets, sidewalks, curb and gutters, etc.) resulting from the development of subdivisions for conformance with standard details or specifications has been centralized.	Inspection of public improvements (i.e., streets, sidewalks, curb and gutters, etc.) resulting from the development of commercial or industrial building permits for conformance with standard details or specifications are assigned to the Street Closure, Excavation, and Encroachment Permits inspection staff.
Engineering Technicians each conduct thirteen to fifteen inspections per day.		Data regarding the number of inspections is not routinely collected. The Technical Specialist 2 is collecting a “snapshot” for MAXIMUS.
A policies and procedures manual has been developed describing the functions, procedures, and tasks associated with plat map review.		A policies and procedures manual has is being developed.

ENGINEERING		
Best Management Practice	Strengths	Opportunities for Improvement
Engineering Technicians utilize automated input devices to record inspection results or display inspection history while in the field.		Automated input devices are not utilized.
Responsibility for the assignment of street names and addresses for new development have been centralized.	Responsibility for the assignment of street names and addresses for new development have been centralized.	This function is assigned to the Capital project Management Section, and not the Development Services Section.
Final plat maps are digitally scanned and indexed within GIS.		Final plat maps are microfilmed rather than digitized.

PARKING OPERATIONS		
Best Management Practice	Strengths	Potential Improvements
PARKING GARAGE		
Garage operations are privatized.	Current operations are partially privatized.	Potential for determining whether the Division should could continue to provide maintenance and supplies for garage operations.
Garage operations are treated as an enterprise fund.		Garage operations have been treated as a general fund service since the mid 1980's. The fund statements do not reflect full costs, including outstanding debt service, so it is not possible to determine actual profitability of the garage operations.
Construction costs for garages should be considered a revenue bond item.		Remaining debt service appears to be general obligation debt.
For contracts operated on a formula using revenue as a basis, there should be an on-going audit of revenue activity.	The Parking Division performs regular, very detailed audits of garage transactions.	
METER OPERATIONS – INSTALLATION AND MAINTENANCE		
Meter repair should occur within one working day of notification of a defect.	Repair or replacement occurs within one working day.	

PARKING OPERATIONS		
Best Management Practice	Strengths	Potential Improvements
Maintenance of a meter inventory	The Division maintains a basic computerized inventory and an inventory log book.	The inventory system should be updated and incorporated within the City's GIS operations.
Meter revenues should be collected on a regular schedule.	The Division has a standing schedule for collections based on location and transaction volume.	
Meter collections should be processed through a counting house, with direct deposit.	The City contracts with Brinks for counting and depositing services.	There is presently no procedure for spot checking the accuracy of the counting services.
PARKING METER ENFORCEMENT		
Meter enforcement is commonly the responsibility of a law enforcement agency.	Meter enforcement is shared by the Parking Division and the Metropolitan Police Department. Division enforcement personnel are actually newly hired Sheriff's Deputies, performing entry service until assigned to Detention duties.	
Ticket issuance is automated.		Development of an automated system is being delayed while the Division and Metro PD make a joint decision on appropriate systems and technology.

PARKING OPERATIONS		
Best Management Practice	Strengths	Potential Improvements
Daily activity of enforcement officers is monitored.	The Division maintains a daily log of activity and the field supervisor and Parking Supervisor review the information regularly.	The activity log is currently prepared manually by staff in another division of the Department based on a manual count of tickets.
Enforcement officers are frequently rotated to different zones.	Officers are rotated on a regular basis among zones; additionally, the staffing system has the effect of rotating personnel approximately every six months.	
Assignment of special zones is commonly a function of Traffic Engineering.		Assignment of special zones is the responsibility of the Parking Supervisor, with approval from the Traffic and Parking Commission.

STAFF SERVICES: FINANCIAL MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
FINANCE AND ACCOUNTING		
There is a clear delineation of duties and responsibilities among finance staff.		Interviews indicate significant overlap in duties, with five employees having four job titles performing similar work.
Adequate controls are in place to assure proper management of revenues.	Review of financial procedures do not indicate any deficiency in formal procedures for financial controls.	<p>The Department has a large number of approval sign-offs for routine procurements.</p> <p>For some contracts, the project staff responsible for reviewing the vendor invoice and the finance staff responsible for processing the payment transaction are married.</p> <p>There are some operational procedures that result in the possibility of checks being lost or misplaced; those have already been discussed with the Department.</p>
Accounts payable transactions are processed in a timely fashion.	The Department appears to be processing all accounts payable in a timely fashion.	

STAFF SERVICES: FINANCIAL MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
Fees are based on an analysis of cost of service and are based on a clearly defined standard of cost distribution.	Fees for parking services are calculated regularly on the basis of potential lost revenue.	Other fees of the Department are not based on actual costs of service.
Budget planning includes development of spending plans based on analysis of historic patterns.	The Department tracks its budget performance on a quarterly basis for the purposes of budget management.	Interviews indicate that the Department does not use its expenditure evaluation for purposes of work planning.
Project costs are tracked to project status to assure that payments are proper.		The Department does not track project costs and project status in a meaningful fashion.
Financial data is provided on a regular basis to managers, in formats that provide managers with detailed performance information.	Finance staff attempt to respond to management requests for budgetary performance information.	Project staff have the impression that the Department does not maximize the reporting capacity of FastNet.
INFORMATION TECHNOLOGY		
Standard of one information technology staff person per 125 work stations	The Department has two persons to support 140 personal computers, 9 network servers, 20 printers, and approximately 10 specialized units.	
Access to network servers and telecommunications links is tightly controlled.		There are no controls to physical access.

STAFF SERVICES: FINANCIAL MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
Information systems are inventoried	The Department has just completed a preliminary inventory of applications.	
Information systems are well documented, with source codes stored in a secured place.	Mainframe applications are maintained by the Metro I.S. Department	Individual applications are not documented or backed up.
Users have the opportunity to participate in periodic application training.	Metro requires certain training for access to the FastNet financial management system.	Only training opportunities provided by Metro I.S. are available. It does not appear that managers receive training in FastNet that enable them to develop customized financial reporting.

HUMAN RESOURCE MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
RISK MANAGEMENT-SAFETY/LOSS CONTROL		
Existence of a Departmental safety plan.	The Safety division has developed a detailed departmental plan.	Work with supervisors and managers to keep line staff informed of the safety plan and procedural changes.
Existence of a safety committee. Coordinated with Metro Human Resources?	The Safety division of Public Works participates in the Metro safety committee, attending regular trainings and informational seminars.	Currently, the Public Works Department does not have a committee relating to safety in which line staff can participate.
Are required programs in place (e.g., OSHA, Drug Free Workplace)?	Yes, the Department provides trainings to meet TOSHA and OSHA requirements. It participates in the volunteer inspection program.	Utilize the information systems to determine need and schedules to state and federal requirements. Maintain accurate and current records of staff training completions and needs.
RISK MANAGEMENT-LIABILITY PROTECTION		
Is there a liability prevention program in place?	Public Works has an informal plan. Safety division educates staff to prevent situations that would case internal claims, such as job site setup programs and inspects job sites to ensure understanding of requirements	Establish formal liability prevention program. Work with Metro to develop the program. Ensure consistency of program through Department.

HUMAN RESOURCE MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
Statistics available to assess losses by type.	Maintains data for employee related loss by type. Metro maintains statistics relating to loss from claims citizens claims.	Review all statistics and data relating to loss periodically.
Litigation reviewed and evaluated for legitimacy.	Public Works captures and provides data on the “who, what, when and why” of situations leading to litigation. Metro Legal Department is responsible for reviewing and evaluating the legitimacy	Work with Metro to implement standard approach for evaluation of legitimacy
PERSONNEL-RECRUITMENT AND SELECTION		
Average recruitment turnaround times within: <ul style="list-style-type: none"> - 45 – 60 days for clerical - 45 – 60 days for operational - 60 –90 days for paraprofessional and technical - 60 –90 days for professional - 120 – 150 days for management 	No records available at DPW to confirm these turnaround times. Metro HR maintains a list, accepting continuous applications for the Maintenance and Repair Worker I positions, which reduces the length of the recruitment. However, for all other positions, Metro HR must re-initiate the advertising and recruitment process as each opening occurs.	Establish target recruitment turnaround times. Review targets with Metro HR and develop recruitment efforts to meet targets.
Proactive advertising and recruiting techniques used for all positions.	Position openings are promoted internally, as well as externally. HR works with Metro HR to advertise. promotions and job openings.	Proactive advertising and recruiting techniques used for all positions.

HUMAN RESOURCE MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
Searches for management personnel are national in scope.	This is conducted by Metro HR.	Searches for management personnel are national in scope.
PERSONNEL-PAY AND CLASSIFICATION		
Classifications are comprehensively reviewed every 5 years? Reclassifications evaluated on an ongoing basis?	This is conducted by Metro HR.	
Turnover is targeted to be less than 10% annually.	Statistics are maintained to determine annual turnover rate. Rate for past two years is 11.2%. Over one third of turnover attributable to retirements.	
Performance ratings linked directly to compensation.	Yes, supervisors and managers perform periodic performance evaluations of staff. Evaluations and subsequent merit raises are tracked by Public Works HR.	
PERSONNEL-LABOR RELATIONS		

HUMAN RESOURCE MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
Does the HR Department handle grievances and/or complaints from employees?	Yes, Public Works HR handles grievances and complaints from employees. If the employee is not satisfied with the resolution, he/she must then take the issue to Metro HR.	
Grievance guidelines clearly defined in the personnel regulations.	Guidelines are set by Metro. Initial drafts of new department handbook have been completed and will include section on grievance procedures in simplified language.	Continue to work with Metro HR to inform staff of guidelines.
Is there an employee handbook and/or employee procedures manual which clearly outlines policies and procedures?	The Training division publishes a supplemental policy and procedures booklet of recent memos issued by management.	Review and update employee handbook periodically. Inform staff of policy changes.
Are periodic surveys conducted to address employee issues and concerns?	Informal meetings are conducted with managers and supervisors to determine the needs of line staff with regard to training.	Develop a formal mechanism, through which line staff, as well as supervisors, can provide input regarding issues.

HUMAN RESOURCE MANAGEMENT		
Best Management Practice	Strengths	Potential Improvements
<p>Do training courses exist? Do they concentrate on professional as well as personal development?</p>	<p>Training Section has developed, and currently delivers, GED and CDL Driver Training programs; has worked with management and staff to identify training needs; and is currently working on a comprehensive annual training program for department to include supervisory, professional, customer service, technical, basic literacy and personal development</p> <p>The Training division collects and distributes information relating to available courses provided in community and Metro.</p>	

ATTACHMENT C: COMPARATIVE SURVEY

As part of the operations review of the Department of Public Works, MAXIMUS conducted a comparative survey focusing on services, workload and methodology utilized in comparable communities. The survey focused on several divisions within Public Works, including Streets and Roads Maintenance, Engineering, and Administration. The sections, which follow, provide an analysis of the survey results.

1. INFORMATION WAS COLLECTED FROM SIX COMMUNITIES.

The project team, in consultation with Metro officials, developed a list of peer communities, which provided services similar to Nashville, which were also comparable in size and growth rate using data from the 2000 Census. The table below shows the participating communities, metropolitan population and growth rates, land area of the incorporated area, the number of satellite stations used by the respective public works departments, and the use of information systems

City	2000 MSA Population	MSA Growth Rate from 1990-2000	Land Area (Sq. Miles)	Satellite Stations	Information System
Nashville	1.2 million	25.0%	533	2	Limited, locally developed
Indianapolis, IN	1.6 million	16.4%	396	3	Hansen IMS
Jacksonville, FL	1.1 million	21.4%	820	6	Limited, locally developed
Louisville, KY	1.0 million	8.1%	66.2	7	Various packages
Raleigh, NC	1.2 million	38.9%	181.4	3	None reported
San Antonio, TX	1.6 million	20.2%	430	7	Extended locally developed mainframe system
Norfolk, VA	1.6 million	8.8%	65.98	7	Hansen IMS

While the population of several of the metropolitan areas was higher than Nashville, the median size of the communities was 1.2 million. Additionally, the growth rate for Nashville is

slightly higher than the median, which is 20.2%. The table, which follows, highlights some general information of the survey Departments of Public Works, including the size of the jurisdiction, automated information system, as well as satellite locations.

The points below discuss the table:

- Jacksonville oversees the largest jurisdiction, providing services from 6 satellite locations. There are 3 locations for maintenance services, 1 for construction, and 2 support locations from which equipment control and fleet services are provided.
- Raleigh services cover 181.4 square miles. Streets and Roads Maintenance operates 1 satellite location, and Engineering maintains 2 for engineering and surveying and infrastructure inspections.
- Nashville provides services from 2 satellite locations, covering approximately 533 square miles, the second largest of the communities.
- While Louisville and Norfolk has the smallest land area, they both use seven satellite work areas, which is the largest number for three of the cities.
- Two cities use specialized commercially acquired public works management systems and the City of San Antonio has a fully developed mainframe management system that developed internally. Nashville, Jacksonville, and Louisville use limited applications that have been locally developed.

The following sections presents the results of the survey.

2. COMMUNITIES PROVIDED INFORMATION WITH REGARD TO STREETS AND ROADS MAINTENANCE.

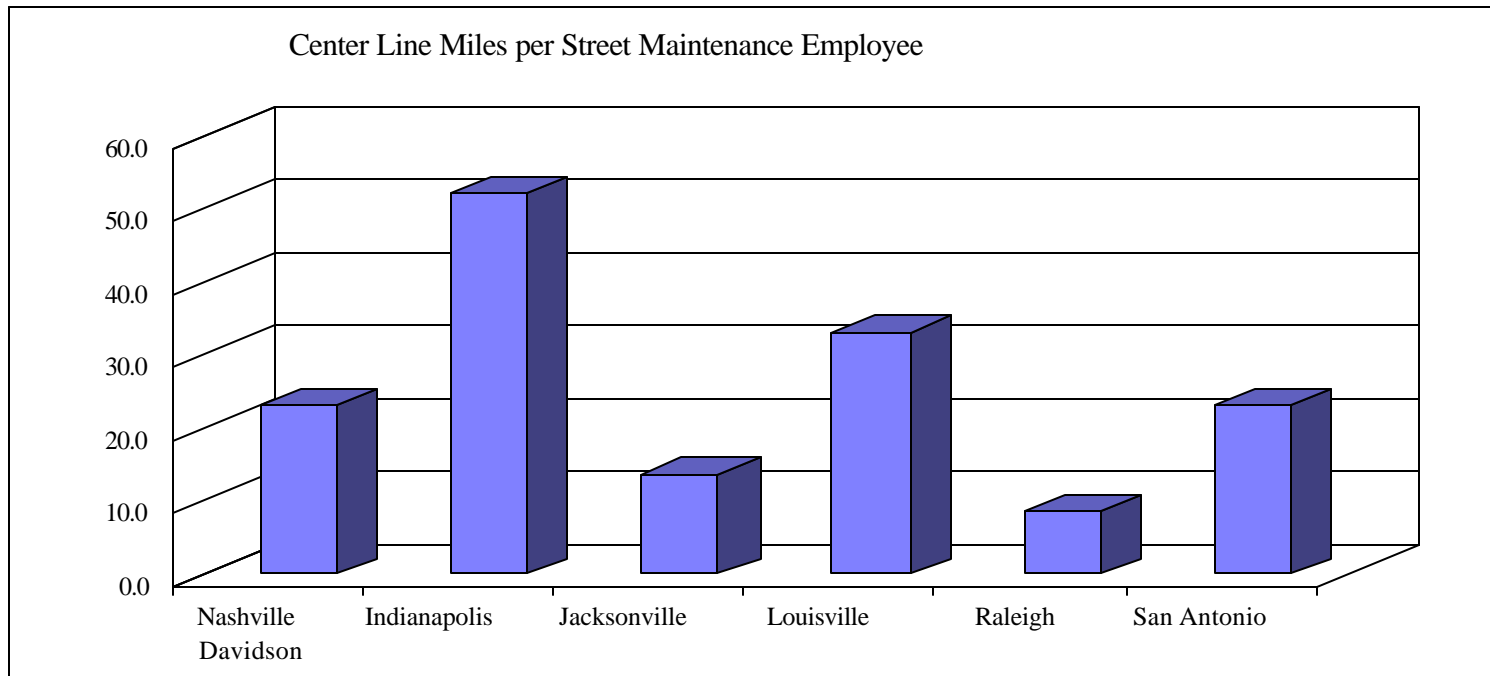
MAXIMUS collected information with regard to Street and Right of Way Maintenance. Data targeted budgets and center line miles. Additionally, data was provided to analyze the allocation of staff to various functions within Street and Roads Maintenance.

The table below provides the responses from the participating communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
What is your current fiscal year operating budget for streets and right of way maintenance?	\$9,332,925	\$3,716,799	\$21,500,000	\$1,339,200	\$7,000,000	–	–
Number of center line miles of streets.	2,154	6,319	3,300	825	922	3,818	1,760
Square yards of pavement:	32,507,915	–	–	15,000,000	–	–	13,000,000
Number of staff assigned to:							
Street Maintenance	93	121	240	25	107	164	108
Signs/Signals	23	45	–	42	–	43	–
Street Sweeping	Contract	–	–	–	20	62	–
Paving	13	–	Contract	Contract	25	36	Contract
Milling	15	–	Contract	Contract	Contract	28	Contract
Tree Removal	18	–	–	Contract	–	5	–
Sidewalk Repair	6	8	–	–	–	6	–
Mowing	9	34	9, plus contract	–	–	46	Seasonal employees
Note: The “-“ indicates that the community did not provide the requested information.							

The following points highlight information from the table on the previous page:

- Several communities outsource paving, as 4 of the responding communities indicated. Additionally, 3 respondents outsource milling services, leaving San Antonio and Nashville as the only communities with employees assigned to milling and paving functions. Although Nashville oversees fewer center line miles, San Antonio maintains a lower staff to centerline miles ratio.
- Jacksonville employs 240 people to provide Streets and Roads Maintenance, assigning work to crews based on location and work orders. Each satellite maintenance location has 1 crew of 3 people assigned to mowing in addition to contracting.
- The graph below illustrates the number of center line miles per Streets and Roads Maintenance employee. Although this is an aggregate ratio, which is not indicative of staffing deficits or surpluses in itself, it is stated here simply as a summary measure for comparative purposes only.



- As the graph above shows, Indianapolis has 52.2 center line miles per Street and Roads Maintenance personnel, while Raleigh has 8.6 center line miles per employee. In Jacksonville, the average is 13.8 center line miles per Streets and Road employee. Nashville and San Antonio are average 23.2 and 23.3 center line miles per Streets and Roads employee, respectively.
- Norfolk and Louisville reassign Street Maintenance crews as needed to repair sidewalks.
- Nashville has 53 additional staff assigned to various crews, including low boy, carpentry, materials management, masonry, vacant lots, and night crews. Indianapolis has an additional 47 people assigned to other crews, as well. As the intent of the graph above is to show ratios of center line miles to personnel directly involved in their maintenance, these positions are not included in the calculations. An attempt was also made to exclude similar employees from the calculations reflected in the graph for the comparative cities as well.

The following subsections highlights information with regard to street sweeping and mowing functions of the Streets and Roads Maintenance divisions.

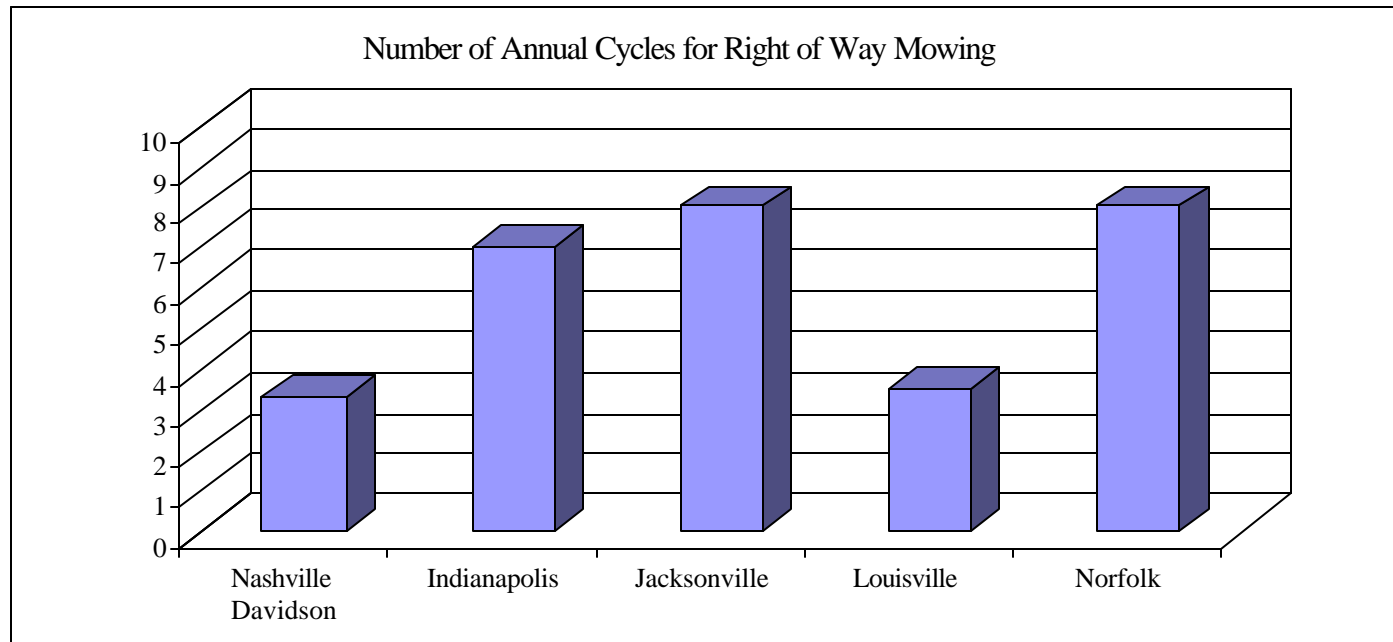
(1) **Nashville Provides Right of Way Mowing Comparable to Louisville, But Provides Less Street Sweeping Than Most of the Surveyed Communities,**

Communities were asked to provide information indicating the frequency of street sweeping and right of way maintenance. As shown in the previous table, services are provided in various ways, resulting in diverse workloads. In the table on the following page, a summary of street sweeping and right of way maintenance is provided.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
The street sweeping frequency for:							
Residential	Once per year	Once per year	Between nine and eleven timers per year	Three times per year	Four times per year	Twice per year	–
Commercial	Four times per year; CBD targeted for once per day	Once per year	Between nine and eleven timers per year	Three times per year	Four times per year	Arterials & collectors four times; CBD once per day	–
How often are rights of way mowed?	3.3 cycles	7 cycles	8 cycles	3.5 cycles	–	3 cycles	8 cycles

The points below provide a summary of the table.

- Nashville maintains a frequency target of 4 times per year for commercial properties and once per year for residential neighborhoods. Both Nashville and Indianapolis sweep residential neighborhoods once per year. All other surveyed communities sweep more frequently than do these two cities. Nashville pays a private contractor \$26.92 per curb mile for sweeping non-CBD areas. This compares favorably to other jurisdictions with which the project team has recent experience.
- Street sweeping in Jacksonville occurs between nine and eleven times per year, as there are minimal streets which have curb and gutter requiring such services.
- The graph, which follows, illustrates the number of mowing cycles completed by the participating communities.
- It should be noted that cycle frequencies for the surveyed communities represent targeted service levels as reported by respondents. The 3.3 cycles shown for Nashville represent a calculated figure for the actual work accomplished in 2001.



- While Nashville has 9 employees assigned to mowing, Indianapolis has almost 4 times the staff and only twice the number of cycles.
- Jacksonville contracts for services as well as operates 3 crews for right of way mowing. Contractors complete 8 cycles per year, while Jacksonville crews have a 45 day cycle during the mowing season.
- Norfolk uses seasonal/temporary workers for right of way mowing, reportedly to keep salary and benefit expenses at a minimum.

The subsection, which follows, highlights the survey results of the sidewalk repair section.

(2) Communities Varied With Regard to Their Sidewalk Inspection Programs.

MAXIMUS collected information from the participating communities regarding sidewalk inspection programs. Approximately half of the communities, including Nashville, utilize a program that proactively inspects sidewalks for potential tripping hazards. The following table highlights the responses.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
Is the Department utilizing a program that proactively inspects sidewalks to identify potential tripping hazards?	Yes	–	Yes	No	No	Yes	No
Sidewalks are inspected once per:	Currently, under contract to inspect all sidewalks this year	–	–	By complaint or request only	By complaint or request only	3 years	–
The backlog of sidewalk repair is:	Not known	2 years	–	6 months	4 months	–	–

As shown in the table, Nashville, Jacksonville, and San Antonio proactively inspect sidewalks for repair. Jacksonville has designated specific areas within the urban core as intensive care neighborhoods, which are inspected weekly. Because Louisville and Raleigh only inspect sidewalks as a result of a citizen complaint, their backlog of sidewalk repair indicates backlog in work generated by citizen complaints. Additionally, Indianapolis has 8 employees assigned to sidewalk repair with a backlog of 2 years. It should be noted that Metro is currently accomplishing a thorough inspection of all sidewalks through a private contract.

(3) Most of the Communities Are Targeting a Level of Service Similar to Nashville With Regard to Patching and Paving.

The participating communities provided data relating to the patching and paving services. While there was variance in responses to some questions, the communities maintained similar goals with respect to pothole patching, annual pavement condition assessments and annual resurfacing of streets. The table below shows the results.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
How long before potholes are patched after a complaint is received?	Attempt to complete within 1 day. All are completed within 30 days.	5 days	1 day	1 day	1 day	2 days	5 days
Do you have a crack filling or sealing program for your streets?	Yes	Yes	Yes	Yes	No	Yes	No
How many tons of asphalt patching material were applied in the past year?	4,016 (1.86 tons per center line mile)	4,937 (0.78/C.L. mile)	6,977 (2.11/C.L. mile)	1,182 (1.43/C.L. mile)	–	7,200 (1.89/C.L. mile)	150 (0.09/C.L. mile)
How often are streets inspected to assess their current condition and establish a pavement condition index?	20% per year	10% per year residential 30% per year for thoroughfares	No, complaint driven process	100% per year	100% per year	20% per year	20% per year
What kind of pavement management software is utilized for the pavement management system?	IMS	Oracle, based on Army Corp of Engineers	Cartograph	Custom program	–	GoodPointe	PMI
What percentage of paved streets are resurfaced on an annual basis?	3%	10%	25%	5%	13%	5.5%	5%

The following points summarize the responses.

- The majority of communities meet their target of 1 day to complete pothole patching work orders resulting from citizen complaints. Norfolk and Indianapolis respond within 5 days. Nashville completes all citizen generate work orders within 30 days. Data are unavailable to determine the degree to which Nashville is successful in meeting the targeted 1-day turnaround time for pothole work orders.
- With the exception of Louisville and Norfolk, all communities have a crack filling or sealer program for their streets. Norfolk is in the process of developing a program, as well as purchasing equipment.
- Jacksonville is the only community that does not rely on a program to assess its roads and establish a pavement condition index. However, the Department has established a new program that will resurface all roads within the next 3 years, completing 750 center line miles per year. Nashville, San Antonio, and Norfolk target 20% of streets annually. Norfolk inspects all roads annually, but conducts major pavement condition index updates in 5 year intervals.
- For the most part, the communities resurfaced between 5% and 13% of paved streets annually. Nashville resurfaces approximately 8.3% annually. This will change significantly as a result of the new capital budget.

The following subsection provides a review of signs and signals.

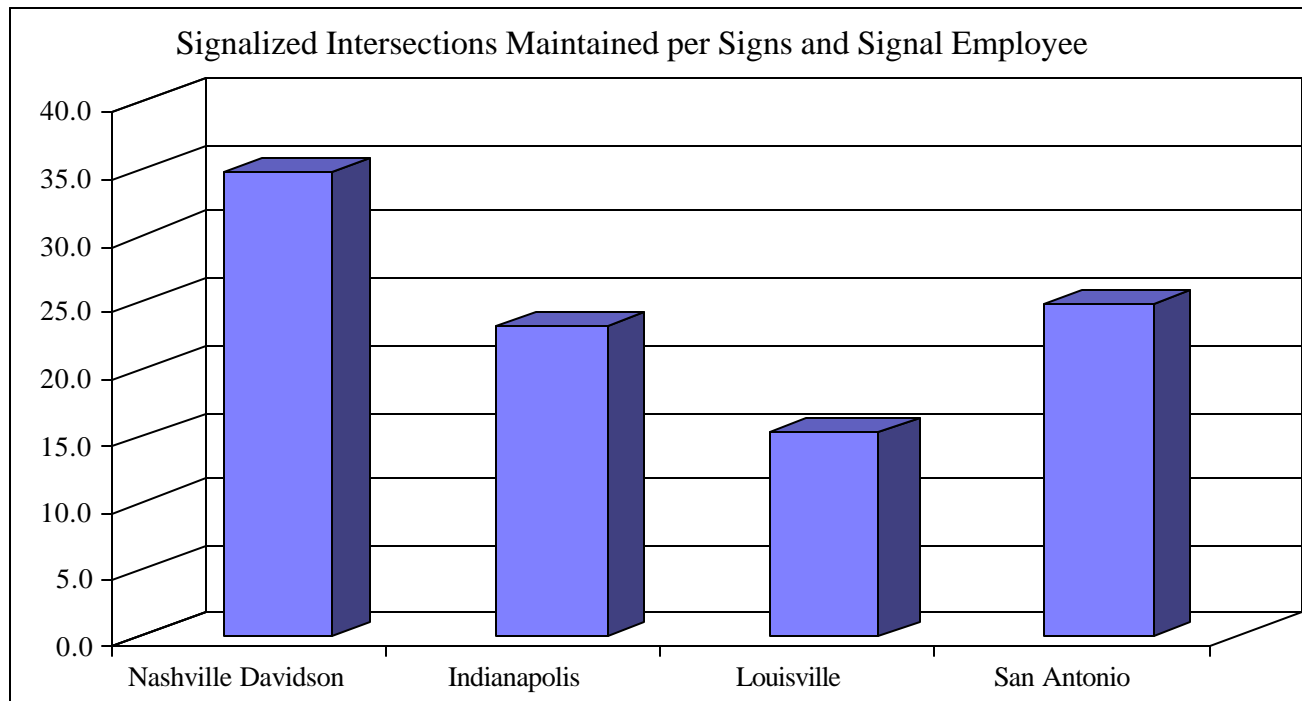
(4) Approaches to Signs and Signals Maintenance Varied.

Communities were asked to provide information with regard to signs and signals, particularly as it related to repair and maintenance. With the exception of Indianapolis and San Antonio, Nashville maintains the greatest number of signalized intersections. The table, which follows, compares the approaches of the various communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
How many signalized intersections are maintained?	800	1,050	–	638	472	1,076	281
How often do you relamp traffic signals indicators, check the head alignment, paint, and services the poles, mast arms, and control cabinets?	Target once per year.	As needed	–	1.5 years	On a call in basis	Overhead PM all intersections annually	2 years
How often do you perform preventive maintenance of the control cabinets?	3.3 years; goal is 2 years	Once per year	–	Once per year for outside CBD 4 months for in CBD	3 years	Ground PM intersections annually	Once per year
How often do you inspect your entire street light system for “burnouts”?	Target is once per year. There were no proactive inspections in 2001	–	–	Once per year, decorative only	Thoroughfares are monthly Residential areas are on a call in basis	Annual replacement program	–

As the table above illustrates, Indianapolis, Louisville, and Norfolk provide preventive maintenance services on control cabinets annually, compared to Nashville’s average of once per 3.3 years. On the other hand, work including relamping, painting, and servicing is targeted to occur annually in Nashville, but on an as needed basis in Indianapolis and Raleigh, and as long as once per 2 years in Norfolk. Further, recent experience by the project team indicates that although San Antonio has an annual target for relamping traffic signals, this target is not currently being met due to staffing shortages.

The graph, which follows, highlights the number of signalized intersections maintained by the Public Works Department per employee assigned to Signs and Signals.



As the graph illustrates, Nashville personnel are responsible for maintaining a greater number of signalized intersections per person than any of the other communities with available data. Nashville has 34.8 intersections assigned per person; San Antonio has 25.0; Indianapolis has 23.3; Louisville has 15.2 signalized intersections per signs and signal staff person. While the graph above provides interesting data, it is important to note that the information does not reflect staffing deficits or surpluses, rather, it presents an aggregate ratio for comparative purposes.

The subsection, which follows, highlights communities' approaches to street painting.

(5) While Nashville Targets Annually Painting Centerlines, Sidewalks, and Pavement Legends, Most Communities Paint On an As Needed Basis.

The participating communities were asked to provide information relating to the painting of centerlines, street crosswalks, and pavement legends. While Nashville completes painting annually, the majority of respondents complete paint tasks on an as needed basis. Norfolk, as the table below shows, paints center lines every 5 to 6 years, and pavement legends 4 to 5 years. Additionally, the participating communities do not have a proactive program to inspect the reflectivity of signs. The table below shows results specific to the communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
How often do you paint your center lines?	Contract: 12 months	12 months	–	12 months	As needed	6 months	5-6 years
How often do you paint your street crosswalks?	Contract: 12 months	As needed	–	Annually on new pavement	As needed	12 months	Varies
How often do you paint your pavement legends?	Contract: 12 months	As needed	–	Annually on new pavement	As needed	As needed	4-5 years
How often do you check the reflectivity of your regulatory signs?	No proactive program	–	–	–	On call in basis	No proactive program	No proactive program

While Nashville repaints crosswalks and centerlines annually through private contract, Louisville only paints annually on new pavement. San Antonio’s goal is to paint center lines every six months, and crosswalks, particularly at schools, every 12 months. Most communities have not implemented a plan to formally assess their painting requirements.

3. INFORMATION WAS COLLECTED FROM ENGINEERING DIVISIONS WITH REGARD TO BUDGETS, STAFFING, AND SERVICES.

In addition to Streets and Roads Maintenance, MAXIMUS collected information from Engineering Divisions to which Nashville could be compared. Data focused on operating and capital budgets, as well as allocation of staff to specific functions. The subsections, which follow, provide an overview of the survey results.

(1) While Budgets and Staffing Varied Among the Communities, the Engineering Divisions, Unlike Nashville’s, Contract the Design of Capital Improvement Projects.

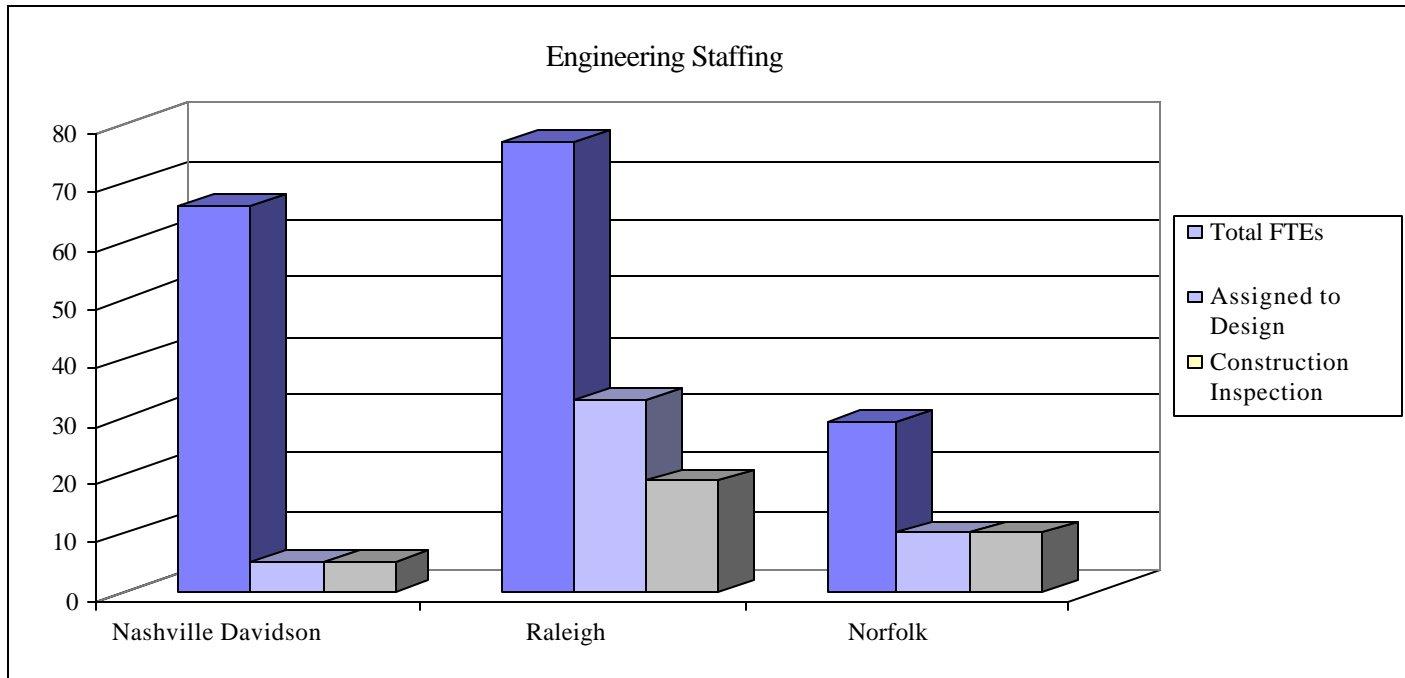
The Engineering Divisions provided information with regard to their operating budget, capital improvement plan, staff, and services. Operating budgets ranged from \$1.5 million to \$65.6 million, while the capital improvement budgets ranged from \$71.0 million to \$1.1 billion. The general data collected from Engineering Divisions is provided in the table below.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
Current year total operating budget for public works engineering.	\$3,146,244	\$65,691,968	\$5,996,001	\$1,657,400	\$5,006,012	–	\$1,581,244
Total Number of FTE staff in public works engineering functions:	66	40	116	26	77	23	29
Number of FTE engineering staff assigned to design.	5	–	–	–	33	–	10
Number of FTE engineering staff assigned to construction inspection.	5	–	45	–	19	38	10
Total five year Capital Improvement Plan budget amount?	\$936,492,000	–	\$1,100,000,000	–	\$71,029,000	\$713,900,000	\$156,233,440
Capital Improvement Plan budget for current fiscal year?	\$350,505,000	\$11,000,000	\$220,000,000	\$11,710,500	\$6,806,000	\$319,800,000	\$39,232,091

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
Estimated % of the design of capital projects performed by consulting (contract) engineers?	95%	100%	99%	–	99%	99%	95%
Describe the standard used for determining to contract for design work on a job or to perform the work internally:	A workload assessment of the capacity to perform the work with in-house staff.	All contracted	None, most work contracted	–	Petitioned projects are designed internally and CIP funded. All other projects are designed by contract.	Complexity of design and amount of time to design project.	Complexity of design and amount of time to design project.

The following points highlight information summarized in the table.

- Engineering in Raleigh is a Department independent from Public Works with a total of 77 full time equivalent positions. Additionally, Raleigh provides engineering, surveying and infrastructure inspections from 2 satellite locations.
- Indianapolis and Norfolk assign the same number of staff to design and construction inspections, while Raleigh assigns 14 more employees to design than construction inspection.
- Nashville has 66 employees of which 5 are assigned to design and 5 to construction inspection.
- While Nashville contracts approximately 95% of the design of capital improvement projects depending on the workload of Metro staff, most communities outsource between 95% and 100% of the design of capital improvement projects. Norfolk, which handles the largest percentage of its capital improvement projects, contracts projects based on the complexity of design.
- The graph on the following page presents information for simple comparison of the responding communities’ approach to general engineer staffing.



As the table above shows, Nashville and Norfolk assign an equal number of staff to design and construction inspection. Raleigh, on the other hand, has more employees assigned to design, which is almost half of all full time equivalent positions for the Department. Additionally, Nashville assigns 8% of its Engineering staff to design and an additional 8% is assigned to construction inspection; Norfolk assigns approximately 34% of its Engineering staff to design and construction inspection each.

The subsection, which follows, provides a summary of the general services provide with the Engineering Division.

(2) Most Engineering Divisions Issue Street Closure Permits, But Do Not Dedicate Staff to Inspect Sites.

Communities were asked to provide information relating to street closure permits. With the exception of Raleigh, all Engineering Divisions issue street closure permits. Additionally, most Divisions do not dedicate staff to inspect street closure sites to ensure adherence to safety requirements. The table below shows the responses of the various communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
Does your agency issue street closure permits for construction work performed in public streets (i.e. water taps, sewer taps, ect.) to permit the closure of one or more lane during the performance of this construction?	Yes	Yes	Yes	Yes	No	Yes	Yes
If so, does the Engineering Division dedicate construction inspectors who perform no other work than the inspection of placement of barricades and warning signs for these street closure permits and the associated utility cuts?	Yes	–	No	No	No	No	Construction inspectors complete street closure inspections as part of their daily routine
If you issue street closure permits, how many did you issue in the past year? How often are the streets closures inspected?	6,561 Permits on major streets are inspected 2-3 times; permits on minor streets are generally not inspected	–	50 Once per closure	5,147 Randomly inspected	–	–	831 Depends on location of projects.

As previously mentioned, most communities do not have dedicated staff to inspect street closures, however, in Norfolk, construction inspectors are required to inspect street closures as part of their daily routine. Jacksonville sets a standard of one

inspection per street closure permit issued. Louisville randomly inspects sites. Nashville has 11 full time equivalent staff assigned to street closure inspections, requiring permits issued on major road to be inspected 2 to 3 times.

(3) Most Engineering Divisions Do Not Use a Cost Accounting System, Project Management Software, or Computerized Traffic Model.

Communities were asked to provide information relating to the use of technology to manage projects and services. Jacksonville is the only community, which uses a cost accounting system to charge time against capital projects for design and inspections. Louisville occasionally uses a cost accounting system, depending on the particular project. Louisville and Norfolk use software to manage the scheduling of capital projects. Norfolk uses MS Access with internally developed modules. While Louisville has the only Engineering Division utilizing a computerized traffic model, all responding communities indicated that they have identified high congestion and crash areas, as well as developed mitigation plans. The table below shows the survey results of the responding communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
Does the Engineering Division utilize a cost accounting system to charge its time against capital projects for design and inspection?	No	–	Yes	Sometimes, depending on the project	No	No	No
Does the Engineering Division utilize project management software such as Microsoft Project to manage the scheduling of capital projects?	Yes, Microsoft Project	–	No	Yes Target 2.0, Windows	No	No	Yes MS Access
Does your agency utilize a computerized traffic model and in-house staff to forecast the impact of development and develop/test mitigating measures?	No	No	No	Yes	–	Yes	No

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
Has your agency identified high congestion intersections and developed traffic mitigation plans for those intersections?	Yes	Yes	Yes	Yes	–	Yes	–
Has your agency identified the highest crash intersections/locations and developed a mitigation plan for those intersections/locations?	Yes	Yes	Yes	Yes	–	Yes	–

As the table above shows, Nashville does not utilize cost accounting system, computerized traffic model to assist in the management of the Division, however, Microsoft Project is used to manage the scheduling of capital projects. While 2 of the participating of the peer communities did use technology to manage projects, 1 community uses Target 2.0 for Windows, and another uses MS Access.

The section, which follows, discusses the survey results residential brush programs.

4. COMMUNITIES PROVIDED RESIDENTIAL BRUSH PROGRAMS DIFFERENTLY.

Although responses were low with regard to residential brush programs, the table below provides the available results. Norfolk provides residential brush collection weekly, with 2 collectors, using semi-automated loaders. This service is provided along with regular refuse collection. On the other hand, Louisville targets a minimum of 2 times per year, with 4 crews of 9 employees, maintaining both routine route, as well as on demand. Louisville also uses variety of methods, including available equipment, as well as manual labor. Equipment includes bulldozers, knuckle booms, payloader, dump trucks, trailers, tractors, and mowers. Norfolk, in addition to the semi-automated loader, will use a boom truck. In the table below are the responses from participating communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
How often do you collect residential brush?	Target 5 times annually	-	-	Minimum of 2 times per year	-	-	Weekly with regular refuse collection
How residential brush is collected?	Currently, chipper in tandem with box truck.	-	-	There are 36 employees assigned. Variety of equipment used.	-	-	2 collectors. Use a semi-automated loader
Is residential brush collected on demand, on a routine route, or combination of both?	Combination	-	-	Combination	-	-	-

The following section compares the parking operations of the participating communities.

5. RESPONDENTS PROVIDED INFORMATION REGARDING PARKING OPERATIONS, INCLUDING BUDGET, METERS, AND STAFFING.

Communities provided information with regard to parking operations, specifically budget, revenue, staffing, as well as number of meters, installation and repair work. The table, which follows, includes available information provided by participating communities.

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
How many parking meters does your jurisdiction maintain?	1,612	4,500	-	4,952	634	2,124	-
How many new parking meters did your jurisdiction install in the past 12 months?	102	0	-	69	7	-	-
On average, how many meters and / or meter heads do you repair per month?	263	125	-	527	126	-	-
How many FTE personnel are assigned to meter installation and repair?	1.5	5	-	8	2	-	-

Question	Nashville	Indianapolis	Jacksonville	Louisville	Raleigh	San Antonio	Norfolk
What is the total operating budget for parking meter operations?	\$621,029	\$385,000	–	\$371,600	\$15,000	–	–
What is the total annual meter revenue?	\$812,480 (\$504/meter)	\$2,200,000 (\$489/meter)	–	\$1,751,600 (\$354/meter)	\$170,00	–	–
Who is responsible for meter enforcement?	Public Works	Contract	–	Police Department	Contract	Public Works	–
Who is responsible for meter collections?	Public Works	Department of Public Works- Collections	–	Department of Public Works- Road Division	Contract	Public Works	–

The points below compare the survey results.

- Parking operations in Indianapolis and Louisville are significantly larger in size than Nashville. Louisville repairs approximately 4 times the number of meters and / or meter heads per month than Indianapolis and double that of Nashville. However, Nashville collects somewhat greater revenues per meter than do the other two jurisdictions for which revenue and meter numbers are available.
- Louisville has 8 employees assigned to installation and repair, while Raleigh does not assign staff to installation, and contracts for meter repair. Nashville has three employees assigned to the meter repair division; approximately half of their duties relate to meter collections and half relate to repair.
- Whereas Raleigh contracts meter enforcement and collections, Indianapolis contracts for only meter enforcement. The Louisville Police Department is responsible for enforcement and its Department of Public Works, as with Indianapolis, is responsible for collection. In Nashville, both the Parking Division and Metro Police enforce meters.

ATTACHMENT D
REVIEW OF PRIOR AUDIT RECOMMENDATIONS

REVIEW OF STATUS OF RECOMMENDATIONS FROM THE 1997 INTERNAL AUDIT REPORT OF THE PUBLIC WORKS DEPARTMENT		
No.	Internal Audit Recommendation	Status
1	The Chipper operation should be made more efficient or privatized. The Chipper cost analysis should be revised to include all costs and true productivity measures, then management should develop a plan for the in-house chipper service to be cost competitive with the contracted service. If this is not feasible, management should prepare and propose a plan to privatize the chipper operation.	The Department is working to improve the chipper operations. This report recommends various changes to the Chipper program to achieve greater performance efficiency.
2	Management should enhance productivity of the refuse collection operation.	Not included within scope of this study but is addressed in the recent Waste Management Study.
3	Management should consider options to improve the cost effectiveness of the recycling program.	Not included within scope of this study but is addressed in the recent Waste Management Study.
4	Noncompliant waste the ash landfill should be removed.	Not included within scope of this study but is addressed in the recent Waste Management Study.
5	Grants that would enable improved services should be obtained. All available grants that would enable Public Works to provide increases in existing services or provide additional services in a cost effective manner should be considered. Researching available grants will help ensure Metro does not miss an opportunity to get state or federal funding to start new programs that would benefit solid waste management.	The Department is becoming more aggressive in securing grants under the Intelligent Transportation System project. However, the Department does not currently have the capacity to monitor grant opportunities routinely. The MAXIMUS recommendations relating to policy management would enable the Department to be more aggressive.
6	Procedures surrounding drop off recycling sites management by civic organizations should be strengthened.	Not included within scope of this study but is addressed in the recent Waste Management Study.

REVIEW OF STATUS OF RECOMMENDATIONS FROM THE 1997 INTERNAL AUDIT REPORT OF THE PUBLIC WORKS DEPARTMENT		
No.	Internal Audit Recommendation	Status
7	The use of outside contracted engineering should be minimized. The practice of contracting engineering services for projects that do not have secured funding should be eliminated, and outside engineering firms should be used on an exception basis when Public Works engineers cannot staff all projects. Additionally, corrections made by Public Works due to outside engineers' errors should result in a reduction of fees paid, and adequate support for all charges should be submitted with invoices and reviewed prior to payment. Tighter control over the use of outside engineers will help ensure related fees are necessary and cost effective.	This practice continues, and the MAXIMUS project team repeats this recommendation.
8	Engineering project tracking systems and overall communications need to be improved. The current project tracking system should be reviewed and improved to correct existing weaknesses. In addition to improving operating efficiency, effective project tracking will minimize Metro's exposure to potential liabilities and lost revenues related to undocumented or inadequate project monitoring.	The condition continues. The MAXIMUS project team provides detailed recommendations in this report to address this on-going issue.
9	Management should consider the feasibility of moving the testing required under the National Pollution Discharge Elimination System program to Water Services.	This was done during the course of this study. An outstanding question, however, is the handling of inspection activity that was not related to this function, which this report makes recommendations to address.
10	Inspection personnel should be more effectively utilized. The inspection operation should be reorganized to utilize personnel more efficiently. Inspectors should be cross-trained and assigned to specific projects or areas to eliminate unnecessary travel time and seasonal down time.	This condition still exists, and this report provides recommendations relating to these issues.
11	Permit fee charges should be reviewed periodically.	Part of this has been done, but the results have not been brought forward for Council consideration. The Department is not collecting all fees which it is currently authorized to collect, and this report provides recommendations relating to this.

REVIEW OF STATUS OF RECOMMENDATIONS FROM THE 1997 INTERNAL AUDIT REPORT OF THE PUBLIC WORKS DEPARTMENT		
No.	Internal Audit Recommendation	Status
12	Annual street paving maintenance should be adequately funded. A funding plan to upgrade and consistently maintain streets should be developed and proposed. Adequate funding will stop the accelerating street deterioration and growing deferred maintenance cost.	This report provides detailed review of the current practices and recommends several changes to the Department's approach to street paving.
13	Management should consider canceling the current street sweeping contract. Public Works should refine the cost analysis of the street sweeping contract to include equipment replacement cost, and if the additional sweeping responsibilities can be performed at a substantially lower cost by Public Works, consideration should be given to canceling the contract.	The Department is currently providing street sweeping in the Central Business District and is contracting services for elsewhere.
14	Street and road maintenance and repair work priorities should be established and managed based on quantitative analysis. Street and road maintenance and repair work priorities should be based on quantitative analysis, and work orders should be processed based on established priorities. Priority status should only be given in emergency situations. Appropriately prioritizing work orders on a timely basis will help ensure that the infrastructure is properly maintained.	The Department needs to continue improvements in this area, and this report provides various recommendations.
15	The Traffic and Parking Commission should rely on information prepared by the traffic engineers. The Traffic and Parking Commission should ensure that any requests honored in opposition to traffic engineer recommendations do not negatively impact traffic in any way. This should help ensure a safe orderly traffic flow for the entire community.	A review of Commission minutes indicate that the Commission still periodically overrides traffic engineering recommendations. MAXIMUS project team observations indicate that the staff should be more specific and firm in providing information and recommendations to the Commission.
16	An effective plan to reduce the risk of abuse of disable parking permits should be developed.	This remains an issue primarily with the manner in which State law is written, interpreted, and managed.
17	Reports for outside requirements and for management's use should be based on accurate, reliable data. Management should review the reports that are currently generated to determine if they are reliable and necessary. This should ensure that the reports used for management decisions and for outside reporting are accurate and effective.	Reporting is still based largely on personal databases, and access to the City's financial system is limited. This report recommends broadening access to the financial management system so that end users can generate their own information and eliminate duplicate systems.

REVIEW OF STATUS OF RECOMMENDATIONS FROM THE 1997 INTERNAL AUDIT REPORT OF THE PUBLIC WORKS DEPARTMENT		
No.	Internal Audit Recommendation	Status
18	Job duties should be realigned where similar duties are performed in more than one area. The department should realign duties where a duplication of effort could occur, including consideration of moving recycling public education to the Parks Department. This would help ensure maximum operational efficiency in those areas.	The problem continues. This reports provides several recommendations regarding the reassignment of work for job duty consistency and operational efficiency. Recycling education is being addressed as part of the overall implementation of the Solid Waste Plan.
19	Employees should be cross-trained and a transition plan for retiring employees should be developed. This transition plan should include not replacing certain employees whose responsibilities have lessened recently. Cross-training and transition planning should ensure a smooth transition of the responsibilities performed by retiring employees and minimal interruption to daily operations when employees are temporarily absent.	Transition does not appear to be an issue at this time; MAXIMUS provides recommendations relating to the assignment of administrative duties.
20	The Parking Division should be accounted for as an enterprise fund and the Equipment Division as an internal service fund.	The Parking Division continues to operate as a general fund unit. Other organizational changes in process will resolve this issue. The Equipment Division has been transferred as part of a Metro-wide central fleet operation.
21	All contracts should be monitored. Public Works should obtain copies of all contracts and other related information, and all contracts should be monitored for compliance. Invoices should be compared to contract terms prior to payment. Thorough contract monitoring will help ensure payments for services are not excessive and revenues due are collected.	Contract management continues to be an issue area, and this report provides extensive review of the issue and appropriate recommendations.
22	A collection plan for delinquent accounts receivable should be developed. The department should develop a collection plan and actively pursue the collection of past due accounts. The plan should include a provision to discontinue service to customers with delinquent accounts. Developing and implementing an effective collection plan would enable Public Works to minimize lost revenues.	This report provides recommendations for improving accounts receivable management.

REVIEW OF STATUS OF RECOMMENDATIONS FROM THE 1997 INTERNAL AUDIT REPORT OF THE PUBLIC WORKS DEPARTMENT		
No.	Internal Audit Recommendation	Status
23	Controls over accounts receivable should be improved, and reconciliations should be performed on a regular basis. Finding an alternative to maintaining both a mainframe accounts receivable system and a manual listing should be prioritized. Address the above findings will reduce the risk of errors or losses going undetected and will reduce the cost of maintaining current systems.	This report provides recommendations for improving accounts receivable management.
24	Cash deposits should be made daily and proper receivable warrant documentation should be maintained. Also, all revenue and cash receipts should be monitored for compliance by Public Works administrative staff. This will reduce the risk of errors or losses.	This report provides recommendations for improving revenue and cash receipting processes.
25	Parts and materials inventory records should be computerized and properly maintained, and basis internal accounting controls over inventory should be implemented. Physical security should be improved to prevent entrance by unauthorized individuals. Enhanced controls over inventory will reduce the risk of undetected losses and help ensure inventory levels are appropriate.	The MAXIMUS project team review of the inventory system identified a continuing need to improve inventory control, and this report includes appropriate recommendations.
26	Public Works should request Public Property to develop a Metro-wide policy addressing employees leasing Metro property. This policy should put the responsibility of executing leases, collecting rent, and obtaining council approval with Public Property and should require an analysis of IRS implications for each lease involving an employee. Such a policy would reduce the risk of lost revenue and potential unrecorded taxable income.	The MAXIMUS review did not indicate that this was currently at issue.
27	Public Works should work with the Public Property Division to update the fixed asset master list.	The MAXIMUS review did not indicate that this was currently at issue; Metro is in the process of a citywide GASB 34 implementation project.
28	Standard petty cash procedures should be followed.	This has been implemented.