Assessment of the Department of Public Works

CITY OF GLOUCESTER, MASSACHUSETTS

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1. INTRODUCTION AND EXECUTIVE SUMMARY

1. INTRODUCTION AND EXECUTIVE SUMMARY

The report, which follows, presents the results of the Organizational and Management Analysis of the Public Works Department conducted by the Matrix Consulting Group for the City of Gloucester.

This first chapter introduces the analysis – outlining principal objectives and how the analysis was conducted – and presents an Executive Summary.

1. AUDIT SCOPE AND OBJECTIVES

As stated in the Request for Proposal, the services sought in this assessment included the evaluation of the current service delivery functions and service components of the Department of Public Works based upon organizational structure, cost, workload, staffing, equipment, demand, frequency, performance and such other factors as deemed appropriate, and the comparison of the service delivery functions and methods in the Department of Public Works with similar services provided by other benchmark communities.

The approach of the project team in meeting this scope is portrayed below.

- **Develop an in-depth understanding of the key issues impacting the Public Works Department.** To evaluate the Public Works Department, Matrix Consulting Group conducted interviews with Public Works Department staff. Interviews focused on goals and objectives, management systems, the use of technology, the levels of service provided by the Department, the resources available to provide those services, etc.

- **Develop a Profile of the Public Works Department.** The Matrix Consulting Group conducted interviews with Departmental staff and other key staff in the City of Gloucester to document the current organization of services, the structure and functions of the Department, budgets, workload data, management systems, inventory of the infrastructure, etc.

- **Conduct a comparison of the Public Works Department programs and practices to "best management practices."** The best management practices included comparisons to the American Public Works Association *Public Works Management Practices Manual*, standards developed by the American Water Works Association such as, *G200: Distribution Systems Operations and Management*, and the experience of the project team. The project team also conducted a comparative survey of departments in other municipalities to compare the Department of Public Works' programs and practices to these other agencies.

- **Evaluate the staffing, organization structure, and service levels in the Public Works Department.** This included interviews with key staff to develop an understanding of the current service delivery model, evaluation of the adequacy of current service levels, work practices, work planning and scheduling systems, productivity and staffing levels, the plan of organization, and asset management.

The objective of this assessment was to identify opportunities for improvement in the operational and economic efficiency of the Department and practicable opportunities for enhancing the quality of its product and services.

2. PROJECT METHODOLOGIES

The processes utilized in developing this study are described in the points below:

- The project team started the project by interviewing Department management to ensure a clear understanding of the Department of Public Works including mission, goals, objectives, business processes, service level targets, performance indicators, and initial issues and opportunities for improvement.

- The project team conducted interviews with the Department's management team, first-line supervisors and various positions with unique functions and / or roles in the Department of Public Works. The purpose of these interviews was to develop a detailed understanding of the Public Works Department including how services are delivered, staffed, managed, and the costs associated with the delivery of those services.

- The project team collected data regarding service delivery by the Public Works Department including organization of services, the structure and functions of the Department, budgets, workload data, management systems, inventory of the infrastructure, etc.
- The project team compared the practices and programs of the Public Works Department to the American Public Works Association Public Works Management Practices Manual, standards developed by the American Water

Works Association such as G200: Distribution Systems Operations and Management, and the experience of the project team. The project team also conducted a comparative survey of Public Works Departments in other cities to compare the Public Works Department's programs and practices to these other cities.

The following section provides a discussion of the structure of the report.

- **Chapter 1: Introduction and Executive Summary.** This chapter presents the scope of work for the management study, project methodologies and a summary of the key findings and recommendations.

- **Chapter 2: Summary Profile of the Public Works Department.** This chapter provides the staffing, budget, organization, and workload for each division in the Public Works Department.

- **Chapter 3: Summary of the Comparative Survey**. The project team administered a comparative survey to other public works departments in the northeast. This chapter compares staffing, workload and services provided in the City of Gloucester to other municipalities.

- **Chapter 4: Major Contacts.** Presents a list of the key personnel that were interviewed as part of this study.

- **Chapter 5: Summary of the Employee Survey.** As part of the management study, employees were asked to participate in an employee survey regarding the Public Works Department. This chapter presents a summary of the survey results.

- **Chapter 6: Analysis of Administration.** This chapter presents a review and analysis of the Administration, including the Director's Office, as well as overall management of the Department.

- **Chapter 7: Analysis of Engineering.** This chapter evaluates the Engineering Division's staffing, workload and processes.

- **Chapter 8: Analysis of Operations.** This chapter presents an analysis of the Department's Operations Division, which includes streets repair maintenance, as well as the maintenance and repair of the City's water distribution and wastewater collection systems.

- **Chapter 9: Analysis of Public Property.** This chapter reviews the Public Properties Division, which includes building and grounds maintenance, as well as maintenance of the City's cemeteries and beach related programs.

- **Chapter 10: Analysis of Central Services.** This chapter analyzes the Central Services Division. This Division is responsible for utility billing, financial services, fleet maintenance, central stores and custodial services.

- **Chapter 11: Analysis of Environmental Engineering.** This chapter evaluates the Environmental Engineering Division, which includes management of the City's treatment contracts, as well as pre-treatment and backflow prevention programs.

- **Chapter 12: Analysis of the Plan of Organization.** This chapter presents a review and analysis of the Department's plan of organization, including overall structure, spans of control and reporting relationships.

The section, which follows, provides a summary of the key findings and recommendations contained in this report.

3. EXECUTIVE SUMMARY

There are a number of major themes that should be considered in evaluating these recommendations. These themes are summarized below.

- The Department needs to enhance the extent, quality, and depth of its management systems.

- The Department needs to enhance the formal planning and scheduling systems for its field operations staff.

- The Department needs to enhance the performance evaluation systems in use to evaluate the performance of the staff of the Department on an annual basis and provide feedback to employees regarding positives as well as opportunities for improvement.

- The Department needs to improve the preventive maintenance of the assets that it is responsible for maintaining, including the water distribution system, wastewater collection systems, stormwater collection system, and streets.

- The Department needs to enhance the productive use of its staff. This staff is underutilized. The Department is outsourcing some services, such as gate valve exercising, that the Department clearly has the skill set and the number of staff to accomplish if the necessary management systems and planning and scheduling systems were in place.

- The Department needs to focus attention on the enhancement of the morale of its staff. The morale of the staff in some of the divisions can be enhanced significantly. The Department needs to develop and install approaches to address this significant challenge.

- There are limited opportunities, in some Divisions, to reduce the levels of staffing given current levels of workload. Until these reductions are accomplished, the Department should focus its efforts on improving the level of service for asphalt maintenance by deploying two crews (for pothole patching and base repair) on a consistent basis, deploying water distribution staff for services that have recently been outsourced such as gate valve exercising and gate valve replacement, and by enhancing the levels of preventive maintenance for the assets maintained by the Department. The project team acknowledges that the Department's level of authorized staffing has already been reduced in the past several years. The number of authorized positions in the Department has been reduced from 87 in FY 2001, to 74.41 in FY 2007. However, as the attached report recommends, the project team believes that further improvements in productivity and levels of service should be made.

* * * * * *

The recommendations contained in this report are presented in the table beginning on the next page.

SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS			
Index	**Recommendation**	**Responsibility for Implementation**	**Cost Increase/(Savings) (including salaries and benefits)**
Chapter 6 – Analysis of the Administration			
6.2	The Public Works Department should develop a clearly written, five-year Strategic Plan.	Director	N/A
6.3	The Department should develop goals, objectives, and performance measures.	Department's Management Team	
6.4	The Department should develop an Information Technology Strategic Plan with at least a three-year horizon.	Director	
6.4	The Department should update the Information Technology Strategic Plan annually.	Director	
6.5	The Public Works Department should develop and install a maintenance management system, and acquire a computerized maintenance management system.	Director	$60,000 in one-time costs and $10,300 in ongoing annual costs.
6.6	The Public Works Department should clearly document its policies and procedures.	Director	
6.6	The Public Works Department should establish a policy and procedure committee consisting of three to five staff that includes a representation of managers from all divisions.	Director	
6.6	The completed policies and procedures manual should be posed on the City's Intranet and Website.	Director	
6.7	The Department should develop a training plan for its employees based upon a needs assessment.	Director and Division Managers	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
6.8	The Public Works Department should develop an equipment operator training program for the proper and safe use of heavy equipment.	Director and Division Managers	
6.9	The Personnel Department should work with the Public Works Department to enhance the Department's employee safety program.	Director, Division Managers and Personnel Department	
6.9	The Public Works Department should establish goals, objectives, and performance measures for its employee safety program.	Director, Division Managers and Personnel Department	
6.9	The Personnel Department should conduct inspections of Public Works Department facilities not less than once a year, and conduct random inspections of work sites in the field not less than four times a year.	Director, Division Managers and Personnel Department	
6.9	The Personnel Director should develop and deliver a "core" safety training course for all City employees. All City employees should be required to attend this training.	Personnel Department	
6.9	The Public Works Department should designate an employee as the Safety Coordinator for the Department with this responsibility to be a related duty.	Director, Division Managers and Personnel Department	
6.9	The Personnel Department should establish a citywide safety committee. The Public Works Department should establish a Department-wide safety committee.	Director, Division Managers and Personnel Department	
6.9	The Personnel Department should develop a citywide employee safety handbook.	Personnel Department	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
6.9	The Personnel Department should develop standard tailgate safety training modules for delivery by first-line supervisors. First-line supervisors should be required to deliver these tailgate safety modules not less than once a month and report the names of the employees that attended.	Personnel Department	
Chapter 7 – Analysis of the Engineering Division			
7.1	The Engineering Division should proceed with implementation of the replacement planning model.	City Engineer	
7.1	The Public Works Director, City Engineer, and Finance Director should develop a plan for implementation of the replacement planning model.	Director, City Engineer and Finance Director	
7.2	The Engineering Division should review its current pavement condition rating system to ensure the legitimacy of the rating system which will allow the City to make properly informed decisions.	City Engineer and Assistant City Engineer	
7.2	The Engineering Division should adopt the pavement condition evaluation methodology developed by the American Public Works Association.	City Engineer	
7.3	The Engineering Division should utilize its full-time Engineering and Highway Maintenance staff to conduct the pavement condition assessment.	City Engineer and Operations Manager	
7.4	The Engineering Division should develop funding strategies that would ensure the proper funding levels related to street maintenance.	Director, City Engineer, and Finance Director	
7.5	The Engineering Division should develop, for consideration of the City Council, a utility cut ordinance that establishes a pavement restoration fee.	City Engineer	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
7.5	The Engineering Division should develop and impose a pavement restoration fee upon utilities making and benefiting from excavations in public streets, including the City's water and sewer utility.	City Engineer	
7.5	Funds that are collected as pavement restoration fees should be expended for the rehabilitation and resurfacing of streets, and deposited in a special revenue fund established for that purpose. The funds deposited in the special revenue fund should include interdepartmental budget transfers for City water and sewer operations utility cuts, and fund transfers at the time of construction contract award for City water and sewer capital improvement projects.	Director and City Engineer	
7.5	The Engineering Division should require utility companies to submit five-year plans for major facility installation to coordinate excavations with the City's resurfacing and the recommended slurry seal program.	City Engineer	
7.5	The Engineering Division should provide an incentive for joint trenching when two or more utility excavators trench by processing a permit as one application saving the utility company costs for permit, plan check, and inspection fees.	City Engineer	
7.6	The Public Works Department should expand the use of non-structural overlays for preventive maintenance of the City's streets.	City Engineer and Operations Manager	
7.7	A design authorization form should be completed by the Engineering Division before the commencement of design for each capital improvement project.	City Engineer	
7.7	The Engineering Division should utilize cost of construction guidelines to document resource requirements for the design and inspection of capital projects.	City Engineer	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
7.7	The Engineering Division should develop a monthly capital project status report and meet monthly with its client divisions / departments to discuss the status of the capital projects.	City Engineer	
7.7	The Engineering Division should develop and install a project accounting system and charge engineering design and construction management hours to projects based upon actual hours worked.	City Engineer	
7.7	A final report should be prepared for capital projects upon completion of construction and acceptance of the improvements.	City Engineer	
7.7	Utilization targets should be established for staff of the Engineering Division.	City Engineer	
7.7	The Engineering Division should develop a 24-month bar chart schedule for the design and construction of all capital projects, and update that chart monthly.	City Engineer	
7.7	A design report should be completed for each significant and complicated capital project when the design is no more than 10% complete.	City Engineer	
7.7	The Engineering Division should implement a consulting engineer evaluation system and utilize this system as part of the final project close-out.	City Engineer	
7.7	The Engineering Division should develop a project management manual and train all professional and technical engineering staff in its use and application.	City Engineer	
7.8	The Engineering Division should perform a financial analysis of fees to determine the fully loaded cost of its operation.	City Engineer	
7.9	The Engineering Division should keep license agreements up-to-date for both the ArcView and AutoCAD programs.	City Engineer	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
7.10	Eliminate the Junior Civil Engineer position.	City Engineer	($67,300)
Chapter 8 – Analysis of the Operations Division			
8.1	The City should purchase one (1) new Tymco 500x regenerative air street sweeper through Cooperative Purchasing Program specifications and one (1) used Tymco 500x regenerative air street sweeper, and surplus its existing two street sweepers.	Director and Division Manager	
8.1	The City should purchase these two regenerative air street sweepers using tax-exempt lease purchase financing.	Division Manager	
8.1	The City should provide street sweeping services with staff resources provided by the Highway Section.	Division Manager	
8.1	The Public Works Department should increase the level of service provided for street sweeping. Residential streets should be swept twice a year. Downtown streets should be swept once a week.	Division Manager	
8.1	The Public Works Department should recycle the sand that was spread over the streets during the winter.	Division Manager	
8.1	The Public Works Department should implement a number of best practices for sweeping of the City's streets.	Division Manager	
8.1	The Public Works Department should develop a monthly report that documents the curb miles swept – including residential curb miles swept – downtown, tons of debris collected, staff hours allocated to street sweeping, and curb miles swept per staff day.	Division Manager	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
8.2	The crew size for pothole patching should be reduced from three to two persons. A "place and roll" approach to pothole patching should be utilized. Pothole patching services should be provided proactively based upon routes, such as snowplow routes, and all streets in the City covered in a two-week period.	Highway Foreman	
8.3	Eliminate a Sign Painter position and three Highway Maintenance Man positions.	Director	($183,600)
8.4	Eliminate three Water System Maintenance Man positions through attrition. Exercise valves with in-house staff. Replace gate valves, in most instances, with in-house staff complementing these efforts with a line stop contractor.	Director	($137,700)
8.5	Managers and supervisors of the Water Section should be held accountable for the consistent preventive maintenance of valves, fire hydrants, meters and air vacuum / pressure release valves.	Director and Division Manager	
8.5	Managers and supervisors of Water Section should consistently dedicate staff to the preventive maintenance of valves, fire hydrants, meters, and air release valves.	Director and Division Manager	
8.5	Preventive maintenance should be accorded the second highest work priority – after emergency repairs – and not an "as time permits" priority.	Director, Division Manager and Foremen	
8.5	The Water Section should allocate not less than one hundred sixty (160) staff days annually to leak testing.	Foreman	
8.6	Water Distribution and Production should initiate a leak detection program.	Foreman	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
8.7	The number of staff for wastewater collection should not be modified. The Working Foreman should be held accountable for the development, installation, and delivery of a preventive maintenance system for catch basins and wastewater collection systems.	Director	
8.8	The Operations Division should develop and install a formal work planning and scheduling system.	Division Manager	
8.9	The Engineering Division should conduct an evaluation of private roads to assess their condition. The City should accept those private roads that are in fair to very good condition and that meet the width requirements of the zoning ordinance.	City Engineer	As much as $214,000 additional annual Chapter 90 revenue
8.10	The City should develop policies to determine which costs should be allocated directly to the sewer fund and which costs should be allocated through an indirect cost allocation plan. The City should make the effort to document which staff members work directly with the Sewer Enterprise Fund and the amount of time each position typically spends over the course of a year. This process should include sampling of workload, time recording to identify specific activities spent during the course of several pay periods, and annual review of duties to ensure the position duties and responsibilities have not changed substantially. The City should develop a comprehensive cost allocation plan with narrative that explains the process of cost allocation of administrative and other indirect costs.	Mayor	
Chapter 9 – Analysis of the Public Properties Division			
9.2	Authorize a Building Maintenance Craftsman position.	Director	$50,600

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
9.2	Reduce the contracts for electrical, plumbing and HVAC by approximately one-third.	Division Manager	($44,890)
9.3	The Department of Public Works should develop a comprehensive inventory of building assets and their components. This should be done in conjunction with the implementation a computerized maintenance management system.	Division Manager	
9.3	The Department of Public Works should conduct periodic condition assessments of City facilities.	Division Manager	
9.3	The Public Works Department should expand its building maintenance programs to develop prevention maintenance programs for City facilities.	Division Manager	
9.3	Develop a work order system for Building Maintenance.	Division Manager	
9.3	The Building Maintenance Staff should not perform any work without the assignment of a written work order.	Division Manager	
9.3	The Public Properties Manager should develop, install, and utilize a work planning and scheduling system.	Division Manager	
9.4	The City of Gloucester should establish cost recovery goals with respect to lease facilities. The Public Works Department should provide decision makers with data relating to operational and capital costs for each lease site.	City Council and Director	
9.5	The Public Properties Division should develop formal service level standards for theparks and grounds that it maintains. A specific level of service should be designated for each site.	Division Manager	
9.5	The Public Properties Division should develop quality standards for the maintenance of City parks.	Division Manager	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
9.5	The Public Properties Division should expand its annual work plan to provide a greater level of detail, including staff and equipment resources required and level, quality and frequency of service seasonally.	Division Manager	
9.5	The Public Properties Division should conduct condition assessments of parks and landscaped areas every six months and follow up with work orders to correct any identified issues or deficiencies.	Division Manager	
9.6	Over the longer-term, the mix of full-time and seasonal employees utilized for grounds and field maintenance should be adjusted. The City should reduce, through attrition, the number of full-time staff by two positions, and reallocate funding to seasonal labor.	Division Manager	($60,200)
9.6	Contracting for park maintenance should be utilized to include all of the mini-parks, building grounds, and fields less than one acre.	Division Manager	
9.6	Reallocate two seasonal positions from the maintenance of cemeteries to the maintenance of grounds and fields. This recommendation should be evaluated in the context of the effectiveness of the use of volunteers for the maintenance of cemeteries.	Division Manager	
9.7	The Recreation Department should be assigned responsibility for management of the City's lifeguard program including the budget for these positions and the recruitment and selection of lifeguards.	Director	
9.7	The thirty seasonal lifeguard positions should be reallocated to the Recreation Department.	Director	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
9.7	The seasonal Office Aide position responsible for providing administrative and clerical support during peak seasons should be reallocated to the Recreation Department. This includes responsibility for the receipt and processing of public request for services, complaints, etc.	Director	
9.7	Those seasonal maintenance workers allocated to the staffing public-owned parking lots, including collecting fees, monitoring lots and assisting with parking of vehicles, should be reallocated to the Recreation Department.	Director	
Chapter 10 – Analysis of the Central Services Division			
10.1	The number of staff authorized for Fleet Services is sufficient.	Division Manager	
10.1	The semi-skilled Maintenance Man position should be upgraded to Mechanic through attrition.	Division Manager	$17,500
10.2	The Fleet Services Unit should acquire a desktop for the utilization of its fleet maintenance management system. Data on this system should be backed up.	Division Manager	$750
10.3	The Central Services Division should develop a formal replacement policy for the City's fleet. This should be adopted by the City Council and provided for review and approval by the Department Director, Finance Director and the City Council.	Division Manager	
10.3	The Central Services Division should develop a five-year replacement plan for consideration of the Public Works Director and the Finance Director that identifies the units proposed for replacement over the next five fiscal years by unit number.	Director, Division Manager, and Finance Director	
10.4	The City should establish a fleet replacement fund.	City Council	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
10.5	The Fleet Services Unit should be established as an internal service fund.	Director	
10.6	The Central Stores Unit should restrict access to the Central Stores Room and implement tighter controls over the physical site.	Division Manager	
10.6	The Central Stores Unit should conduct periodic audits of inventory to provide better controls over the inventory.	Division Manager	
10.6	The Central Stores Unit should reduce the amount of inventory in its stockroom and stock those items with high turnover.	Division Manager	
10.6	Central Stores should track inventory turnover and the dollar value of the inventory.	Division Manager	
10.6	The Finance Department should conduct an annual internal control audit of Central Stores.	Finance Department	
10.7	The Central Stores Clerk should assist the Fleet Services Unit with tracking worker orders once the fleet management system is in place.	Central Stores Clerk	
10.8	The Division should eliminate a Meter Reader position once the Department has fully (and successfully) converted the City to radio read meters.	Director	($50,600)
10.9	The City of Gloucester should issue an Invitation to Bid for the City's custodial services	Director	Unknown
10.10	The position allocated to manage the solid waste contract and to promote recycling should be re-focused on providing analytical support to the Public Works Director with an office in close proximity to the Public Works Director.	Director	

Index	Recommendation	Responsibility for Implementation	Cost Increase/(Savings) (including salaries and benefits)
10.11	The expenditures and revenues of solid waste services provided by the City, either through its own staff or through contract, should be funded through an enterprise fund.	Director	
10.12	The City should use a mix of trash sticker revenue and annual fees to fund the costs of solid waste collection and recycling.	Director	
Chapter 11 – Analysis of the Environmental Engineering Division			
11.1	Eliminate the Cross Connection Inspector position.	Director	($58,800)
11.2	The Environmental Engineering Division should fill the vacant principal clerk position as budgeted. This position should assist with the administration of the industrial pre-treatment program and the cross connection program. Technical functions should be provided by the Pre-Treatment Coordinator.	Environmental Engineer	
Chapter 12 – Analysis of the Plan of Organization			
12.4	Eliminate a division-head position (either the Public Properties Manager or the Water-Sewer-Highway Manager).	Director	($77,500)
12.5	Eliminate one of the two Foreman / Craftsman positions assigned to Water and Wastewater.	Director	($57,700)

2. PROFILE OF THE PUBLIC WORKS DEPARTMENT

2. PROFILE OF THE PUBLIC WORKS DEPARTMENT

In this chapter, the project team presents a descriptive profile of the Public Works Department. The descriptive profile includes organizational charts for the Department, summary descriptions of key roles and responsibilities of staff for the Public Works Department, and, where available, workload data.

1. THE PUBLIC WORKS DEPARTMENT HAS A FY 2007 ALL FUNDS BUDGET OF $15,189,591.

The table below presents the fiscal year 2006 budget, actual fiscal year 2006 expenditures, and the fiscal year 2007 budget for the Public Works Department.

UNIT / PROGRAM	FY 2006 Budget	FY 2006 Actual	FY 2007 Budget	% Change FY 06 Actual to FY 07 Budget
Administration	$44,130	$45,372	$46,238	2%
Cemeteries	$64,414	$65,710	$64,161	-2%
Central Services	$898,351	$1,082,136	$1,051,186	-3%
Engineering	$68,284	$69,416	$71,296	3%
Highway	$624,503	$618,508	$601,765	-3%
Public Properties	$1,162,247	$1,231,518	$1,189,196	-3%
Snow & Ice Removal	$379,400	$584,286	$582,296	0%
Solid Waste	$1,760,856	$1,741,823	$1,700,804	-2%
Subtotal General Fund	**$5,002,185**	**$5,438,769**	**$5,306,942**	-2%
Cross Connection	$47,985	$47,985	$37,929	-21%
Sewer Enterprise	$4,666,911	$4,731,447	$4,561,402	-4%
Water Distribution	$4,423,841	$4,427,672	$4,138,942	-7%
Water Filtration	$1,274,921	$1,271,090	$1,144,376	-10%
Subtotal Enterprise Funds	**$10,413,658**	**$10,478,194**	**$9,882,649**	-6%
TOTAL	**$15,415,843**	**$15,916,963**	**$15,189,591**	-5%

The points, which follow, provide a brief discussion of the information provided in the table.

- Functions supported by the general fund include solid waste, cemeteries, engineering, highway, snow and ice removal, public properties and central services.

- General fund expenditures are budgeted for a 5% decrease from FY 2006 actual expenditures to FY 2007 budgeted expenditures.
- Water distribution and treatment, as well as wastewater collection and treatment are supported by enterprise funds. Enterprise expenditures are budgeted for a 8% decrease from FY 2006 actual expenditures to FY 2007 budget expenditures.

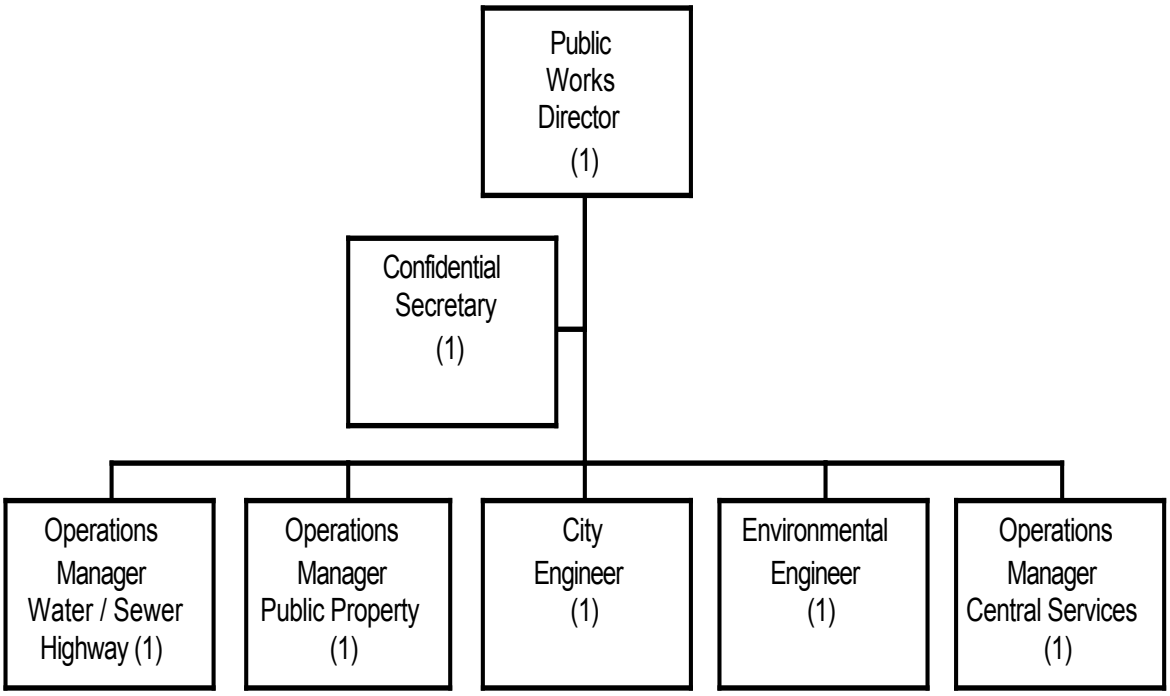
The sections, which follow, provide a summary of the Divisions in the Public Works Department. It should be noted that information was complied based on interviews of Public Works Department personnel.

1. PUBLIC WORKS ADMINISTRATION

The Public Works Administration Division is responsible for management of several functions within the Public Works Department including Engineering, Water & Sewer Utilities, Central Services, Public Properties, Environmental Engineering, Solid Waste, Cemeteries, Facilities Maintenance, and Highway Operations. The table, which follows, presents the budget for the Public Works Department.

(1) Organization

The organization of this division is presented in the organizational chart below. As the chart depicts, the Public Works Director is responsible for the management of five divisions including the Operations (Water-Sewer-Highway) Division, The Public Properties Division, the Engineering Division, the Environmental Engineering Division, and the Central Services Division. The Administrative Assistant supports the Public Works Director.



(2) Staff Roles and Responsibilities.

The following table provides a summary of the key roles and responsibilities for the Director and the Confidential Secretary:

Function	Staffing By Classification		Roles and Responsibilities
Public Works Administration	Director	1	• This position provides the overall executive management and administration of a grouping of divisions within the DPW. • Responsible for developing the overall priorities of the Department, including the development of policies and procedures, performance goals and objectives, monitoring of budget, etc. • Prepares the operating budget and confers with City Management on formulating the City's capital improvement program, and meets with division managers on a regular basis to discuss operations, issues, performance, etc.
	Confidential Secretary	1	• This position is responsible for the administrative support of the Department including all personnel related activities including payroll, personnel action forms, and leave requests. • Reports directly to the Director of Public Works. • Coordination of dig safe assignments.

(3) Summary of Operations

The table below provides a summary of the services provided by Administration.

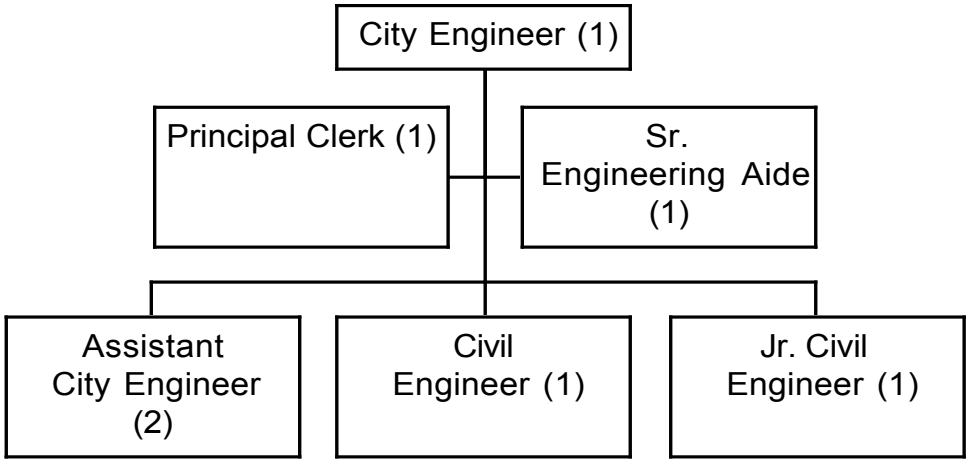
Function	Description of Services and Key Workloads
Administration	• Responsible for developing the overall priorities of the Department, including the development of policies and procedures, performance goals and objectives, monitoring of budget, etc. • Prepares the operating budget and confers with City Management on formulating the City's capital improvement program, and meets with division managers on a regular basis to discuss operations, issues, performance, etc. • Direct supervision of Water, Sewer & Highway Divisions, the Public Properties Division, Central Services Manager, Engineering Division, as well as Environmental Engineering.

2. ENGINEERING DIVISION

The City Engineer is responsible for managing the Engineering Division. The division is responsible for the management, design, and coordination of City capital improvement projects related to streets, water, sewer, sidewalks, parks, and bridges. The Division is authorized 7 staff including the City Engineer.

(1) Organization

The organization of this division is shown by the following organization chart, which also includes the number of authorized positions for each classification:



(2) Staff Roles and Responsibilities

The table, which follows, presents the roles and responsibilities of staff in the Engineering Division.

Function	Staffing By Classification		Roles and Responsibilities
Engineering Division	City Engineer	1	• Provides oversight to the Engineering Division for the Department of Public Works. • Responsible for annual budget, personnel issues, and Departmental planning objectives. • Provides oversight of capital improvement design and construction related to water, sewer, streets, and bridge capital projects.
	Assistant City Engineer	2	• Responsible for design of various City capital related projects. • Works directly with consultants in the design and construction of City capital projects related to water, sewer, drainage, streets, seawalls, and bridge capital projects. • Oversees Departmental staff in the completion of their duties and responsibilities. • Assists public in answering platting or mapping related questions. • Performs inspections related to capital project construction. • Maintains City's pavement management system.
	Civil Engineer	1	• Responsible for design of various City capital related projects. • Works directly with consultants in the design and construction of City capital projects related to water, sewer, drainage, streets, seawalls, and bridge capital projects. • Oversees Departmental staff in the completion of their duties and responsibilities. • Assists public in answering platting or mapping related questions. • Member of Technical Advisory Group which reviews zoning changes, subdivisions, and planning developments. • Performs inspections related to capital project construction.

Function	Staffing By Classification		Roles and Responsibilities
Engineering Division (Cont'd)	Jr. Civil Engineer	1	• Responsible for design of various City capital related projects. • Works directly with consultants in the design and construction of city capital projects related to water, sewer, drainage, streets, seawalls, and bridge capital projects. • Assists public in answering platting or mapping related questions. • Performs inspections related to capital project construction. • Assists customers with research of maps and information. • Tasked with developing GIS mapping of City infrastructure.
	Sr. Engineering Aide	1	• Reports to the City Engineer. • Creates and maintains databases for the Engineering Division with respect to capital projects, including sewer projects, private way easements, betterments, etc. • Responsible for receipt and updating of all maps from the Assessors Department. • Responsible for street numbering and naming, as well as related changes. • Responsible for issuing sewer permits, as needed. This includes annual contractor licensing.
	Principal Clerk	1	• Reports to the City Engineer. • Responsible for all administrative functions in the Engineering Division. • Works with the City Engineer to develop and manage annual operating budget. • Responsible for inputting data into the financial management system, including purchase requisitions, payroll data, etc. • Provides general administrative and clerical support to the Division. • Staffs the front counter and answers phones, etc. • Processes payment requisitions for construction vendors and consultants. • Assists customers with research of maps and information. • Prepares all Department purchase orders for the Department.

(3) Summary of Operations

The table below provides a summary of the services provided by the Division.

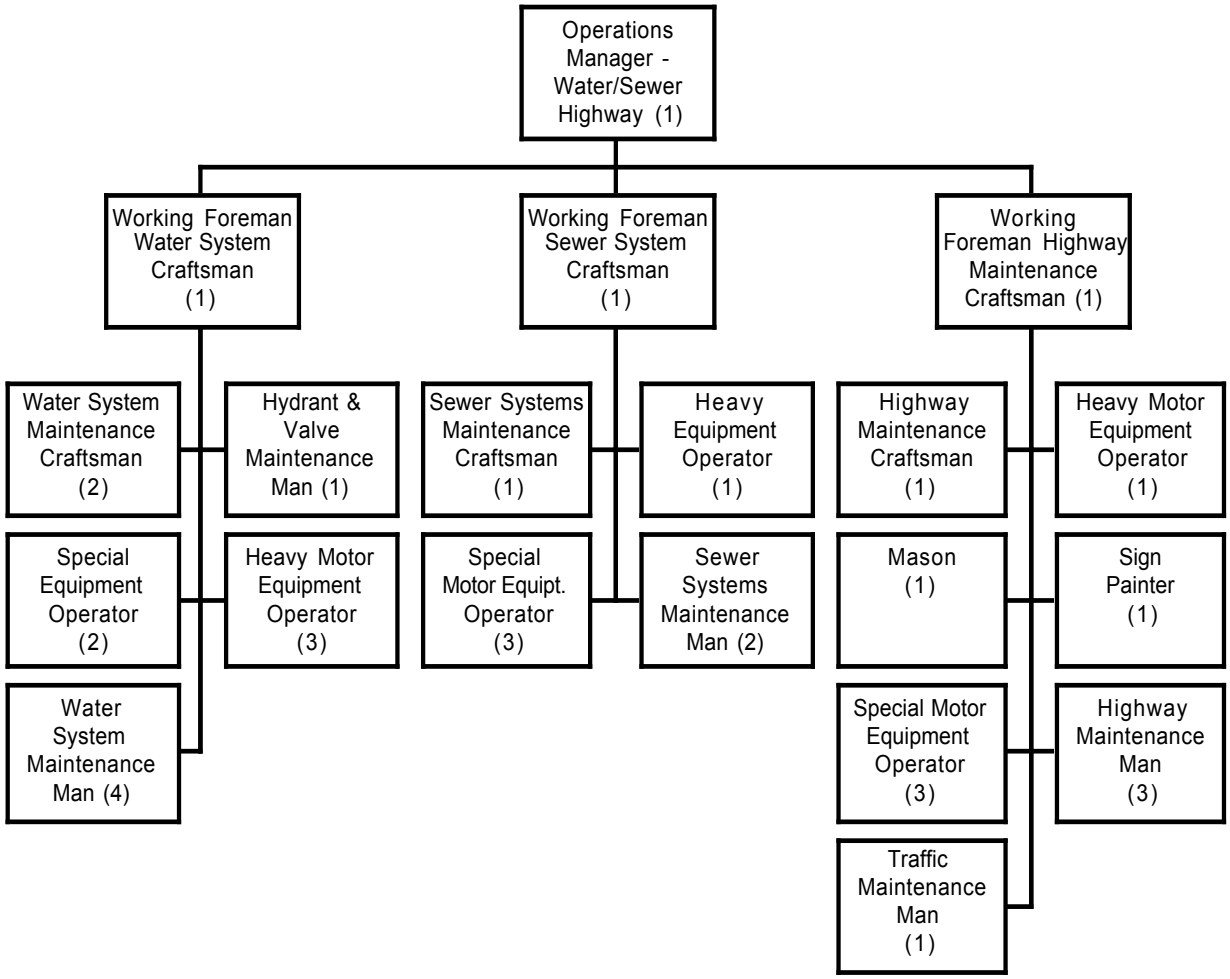
Function	Description of Services and Key Workloads
Engineering	• Responsible for design of various City capital related projects. • Works directly with consultants in the design and construction of city capital projects related to water, sewer, drainage, streets, seawalls, and bridge capital projects. • Assists public in answering platting or mapping related questions. • Performs inspections related to capital project construction. • Maintains City's pavement management system.

3. OPERATIONS DIVISION

The Division Manager manages the Operations Division. This division is responsible for the maintenance and repair of the City's water distribution, sewer collection, and highway infrastructure. The wastewater and water treatment plants are managed and operated by a private vendor through contracts with the City. The Environmental Engineering Division is responsible for managing the contracts for the wastewater and water treatment plants.

(1) Organization

The organization of this division is presented in the organizational chart below. As the chart indicates, the Operations Manager is responsible for the supervision of three Working Foreman / Craftsman: one each for water, sewer, and for highways. Water is authorized 13 positions, Sewer 8 positions, and Highway 12 positions. The Division is authorized a total of 34 positions including the Operations Manager.



(2) Staff Roles and Responsibilities

The table, which follows, presents the staff roles and responsibilities for the Operations Division.

Function	Staffing By Classification		Roles and Responsibilities
Operations Division	Operations Manager	1	• Manages and directs the daily activities of the Water, Sewer and Highway work groups. • Plans and schedules maintenance projects. • Receives and assigns emergency repair work orders.
Highway	Working Foreman	1	• Oversees the daily operations related to the City's Highway Department. • Plans and assigns daily workloads for staff. • Responsible for personnel related activities including timesheets, leave requests, etc.

Function	Staffing By Classification		Roles and Responsibilities
Highway (Cont'd)	Highway Maintenance Craftsman Heavy Equipment Motor Operator Special Equipment Motor Operator Highway Maintenance Man Mason Traffic Maintenance Man	1 1 3 3 1 1	• Provides street sweeping services for the City (currently being contracted out due to broken-down sweepers). • Provide street maintenance repairs primarily related to pothole patching. • Provide roadside brush cutting services to DPW, as well as wetsheds. • Installation and repair of damaged guardrails. • Installation and repair of City sidewalks. • Provides snow and ice road maintenance services for the City. Supervises contractors related to snow and ice. • Repairs manholes, catch basins, and curbstones. • Provides roadside cleanup related to debris and accidents.
	Sign Painter	1	• Paints and refurbishes city signage. • Repairs and erects city signage.
Water	Working Foreman	1	• Oversees the daily operations related to the City's Water Department. • Plans and assigns daily workloads for staff. • Responsible for personnel related activities including timesheets, leave requests, etc.
	Water System Maintenance Craftsman Heavy Motor Equipment Operator Hydrant & Valve Maintenance Man Special Equipment Operator Water System Maintenance Man	2 3 1 2 4	• Provides the maintenance and management of the City's water distribution system. • Repair, maintenance, and painting of hydrants including flushing of hydrants. • Repair, maintenance, and installation of City water lines. • Responsible for locating water utilities for dig safe hotline. • Responds to customer requests for service calls. • Currently trying to replace water valves throughout the City.

Function	Staffing By Classification		Roles and Responsibilities
Sewer	Working Foreman	1	• Oversees the daily operations related to the City's Sewer Department. • Plans and assigns daily workloads for staff. • Responsible for personnel related activities including timesheets, leave requests, etc. • Supports the wastewater plant by providing heavy equipment to clean pump stations wet wells, assist with tank cleaning and line clearing at the treatment plant.
	Sewer Systems Maintenance Craftsman Heavy Equipment Operator Special Motor Equipment Operator Sewer System Maintenance Man	1 1 3 2	• Provides the maintenance and management of the City's sanitary sewer collection system. • Responsible for sanitary system related to both the City's sewer step system and septic system, which use grinder pumps. • Assists outside vendor with preventive maintenance related to sewer step system by pumping all solids from internal pots. • Responsible for pumping of all solids from grinder pumps when breakdowns occur. • Cleans grease traps and septic systems for parks, beaches and schools. • Responsible for all repairs outside internal septic pots. • Periodic cleaning of catch basins. • Jet rod any clogged sewer lines. • Repair, maintenance, and installation of city sewer lines. • Responsible for locating sewer utilities for dig safe hotline.

(3) Summary of Operations

The table below provides a summary of the services provided by each section.

Function	Description of Services and Key Workloads
Highway Section	• Provides street sweeping services for the City (currently being contracted out due to broken-down sweepers). • Provide street maintenance repairs primarily related to pothole patching. • Provide roadside brush cutting services to DPW. • Installation and repair of damaged guardrails. • Installation and repair of City sidewalks. • Provides snow and ice road maintenance services for the City. Supervises contractors related to snow and ice. • Repairs manholes, catch basins, and curbstones. • Provides roadside cleanup related to debris and accidents. • Repairs and erects street signs.

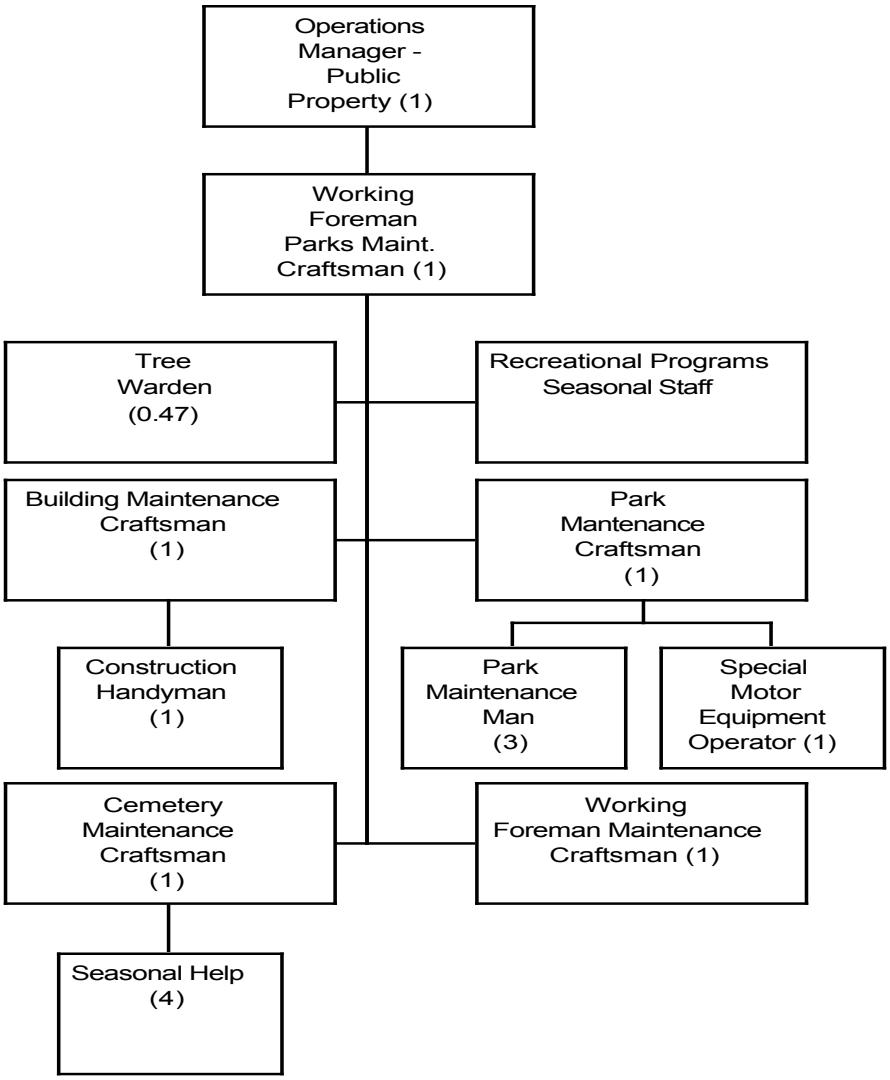
Function	Description of Services and Key Workloads
Water Section	• Provides the maintenance and management of the City's water collection system. • Repair, maintenance, and painting of hydrants including flushing of hydrants. • Repair, maintenance, and installation of city water lines. • Responsible for locating water utilities for dig safe hotline. • Responds to customer requests for service calls. • Currently trying to replace water valves throughout the City.
Sewer Section	• Provides the maintenance and management of the City's sanitary sewer collection system. • Responsible for sanitary system related to both the City's sewer step system and septic system, which use grinder pumps. • Assists outside vendor with preventive maintenance related to sewer step system by pumping all solids from internal pots. • Responsible for pumping of all solids from grinder pumps when breakdowns occur. • Cleans grease traps and septic systems for parks, beaches and schools. • Responsible for all repairs outside internal septic pots. • Periodic cleaning of catch basins. • Jet Router any clogged sewer lines. • Repair, maintenance, and installation of city sewer lines. • Responsible for locating sewer utilities for dig safe hotline.

4. PUBLIC PROPERTIES DIVISION

The Public Properties Division is responsible for the maintenance and repair of City property, including public facilities, as well as grounds maintenance. Grounds maintenance includes mowing, seasonal trash removal, beach cleaning, maintenance of athletic fields and parks (including School grounds), installation and maintenance of playgrounds and maintenance of public cemeteries. In addition to grounds maintenance, this Division oversees the repair and maintenance of all public facilities, including maintenance of service contracts, fuel and utilities, etc.

(1) Organization

The organization of this division is shown by the following organization chart, which also includes the number of authorized positions for each classification. The division is authorized 11.47 full-time equivalent staff including the Operations Manager.



(2) Staff Roles and Responsibilities

The table, which follows, provides a summary of the staff roles and responsibilities in the Public Properties Division.

Function	Staffing By Classification		Roles and Responsibilities
Public Properties Division	Operations Manager	1	• Manages and directs the daily activities of the Public Properties Division. • Plans and schedules maintenance projects. • Receives and assigns emergency repair work orders. • Serves as the Division liaison with Central Services on issues relating to the Cemeteries.

Function	Staffing By Classification		Roles and Responsibilities
Public Properties Division (Cont'd)	Working Foreman Maintenance Craftsman	1	• Oversees sections related to building maintenance, cemeteries, grounds maintenance, field maintenance, beach operations, and forestry. • Provides work assignments to division staff.
Building Maintenance	Senior Building Maintenance Craftsman Building Maintenance Craftsman	1 1	• Responsible for providing building maintenance services to City owned and leased buildings. • Provide minor electrical, heating, and plumbing services to City departments. • Works with outside vendors regarding more extensive or complicated building repairs. • Provides carpentry related to departments as requested or assigned. • Winterizes City buildings for beaches and concessions.
Cemeteries	Cemetery Maintenance Craftsman Seasonal	1 4	• Provides general maintenance and upkeep of three City cemeteries. • Responsible for grass, trimming, and brush trimming. • Also responsible for setting gravestones and markers.
Grounds Maintenance	Parks Maintenance Man Construction Handyman Special Motor Equipment Operator Seasonal	1 1 1 3	• Responsible for mowing and trimming of City grounds and right-of-way. (10 to 12 monuments and City buildings). • Responsible for refuse collection.
Field Maintenance	Park Maintenance Craftsman Parks Maintenance Man Seasonal	1 2 2	• Responsible for mowing and trimming of athletics field for both the City and school system. • Responsible for painting and striping of athletic fields.

Function	Staffing By Classification		Roles and Responsibilities
Public Infrastructure Division / Beach Operations	Maintenance Man (Seasonal) Lifeguards (Seasonal) Office Aide (Seasonal)	12 30 1	• Responsible the maintenance of City-owned beaches. • Provide beach raking, trash removal, and maintenance of beach facilities (e.g., restrooms, concessions, etc.). • Responsible for staffing public-owned parking lots, including collecting fees, monitoring lots and assisting with parking of vehicles. • Lifeguards are responsible for monitoring beaches and waterways to ensure safety of customers. • Office Aide provides administrative and clerical support during peak seasons. This includes receipt and processing of public request for services, complaints, etc. • Staff are seasonal and typically work from April through August.
Public Infrastructure Division / Forestry	Tree Warden	0.47	• Responsible for pruning, trimming, and removal of trees within the City's ROW.

(3) Summary of Operations

The table below provides a summary of the services provided by each section.

Function	Description of Services and Key Workloads
Building Maintenance	• Responsible for providing building maintenance services to City owned and leased buildings. • Provide minor electrical, heating, and plumbing services to City departments. • Works with outside vendors regarding more extensive or complicated building repairs. • Provides carpentry related to departments as requested or assigned. • Winterizes City buildings for beaches and concessions.
Cemeteries	• Provides general maintenance and upkeep of three City cemeteries. • Responsible for grass, trimming, and brush trimming. • Also responsible for setting gravestones and markers.
Grounds Maintenance	• Responsible for mowing and trimming of city grounds and ROW (10 to 12 monuments and City buildings). • Responsible for refuse collection.
Field Maintenance	• Responsible for mowing and trimming of athletics field for both the City and school system. • Responsible for painting and striping of athletic fields.

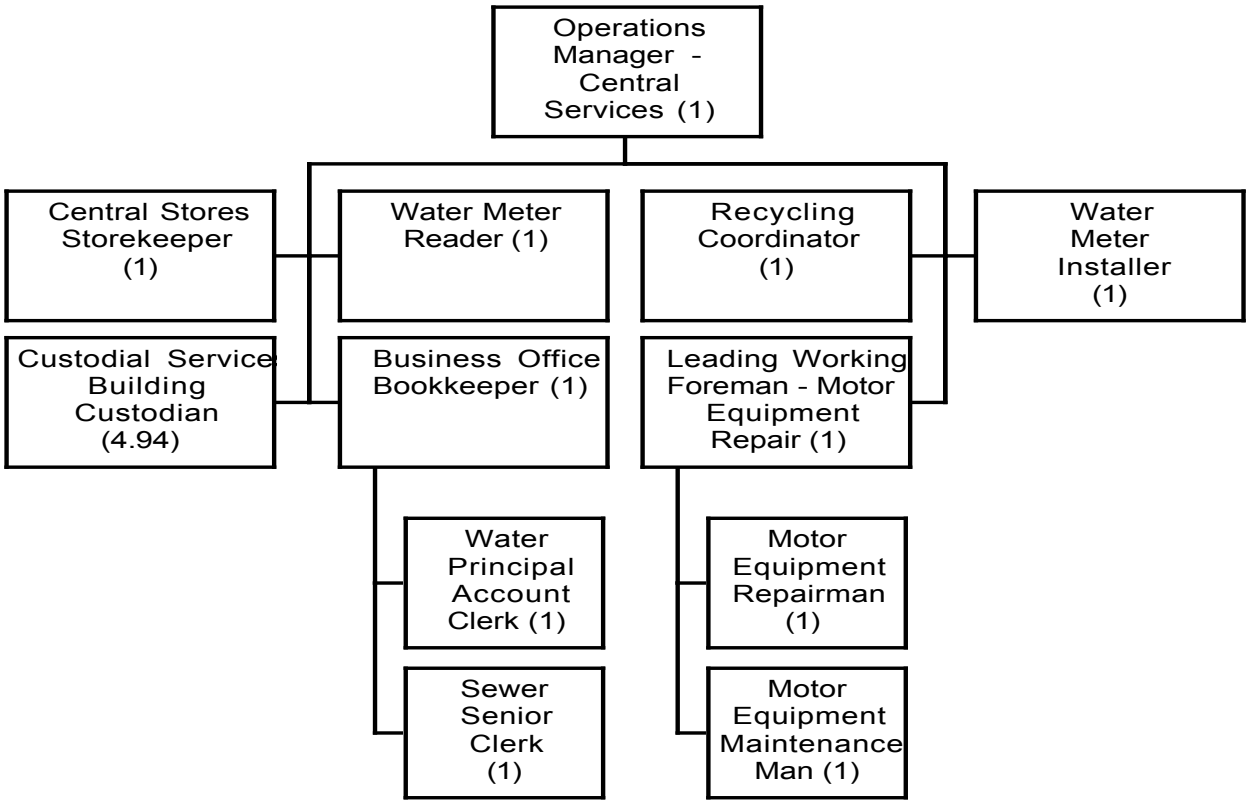
Function	Description of Services and Key Workloads
Beach Operations	• Responsible for the seasonal maintenance of beaches, including grounds and facilities. • Responsible for the provision of lifeguards to monitor beaches and ensure safety.
Forestry	• Responsible for pruning, trimming, and removal of trees within the City's ROW.

5. CENTRAL SERVICES DIVISION

The Manager of the Central Services Division oversees the functions related to the business services office, central stores, vehicle maintenance, water meters, and Solid Waste Recycling.

(1) Organization

The organization of this division is shown by the following, which also includes the number of authorized positions for each classification.



(2) Staff Roles and Responsibilities

The table, which follows, presents the roles and responsibilities for staff in the Central Services Division. This division is authorized 15.94 full-time equivalent staff including the Operations Manager.

Function	Staffing By Classification		Roles and Responsibilities
Central Services Division	Operations Manager	1	• Manages and directs the daily activities of the Central Services Division. • Plans and schedules works, as necessary. • Receives and assigns emergency repair work orders. • Serves as the Division liaison with Public Properties Division on issues relating to the Cemeteries. • Coordinates with members of the public with respect to burial lot sales.
Custodial Services	Building Custodian Part-Time Custodians	4.0 0.94	• Custodial services are provided to public facilities, including City Hall, Senior Center, Library, Public Works, and Veteran's Center.

			• Services are not provided by this group to fire and school department facilities.
Central Stores	Storekeeper	1	• Responsible for overseeing the Department of Public Works Central Stores Department. • Responsible for ordering and maintaining inventory levels for Departmental supplies and parts. • Does periodic inventory checks of stock inventory levels. • Maintains and monitors Gas Boy Fuel System for City. • Provides accounting records for inventory issues by Department.
Vehicle Maintenance	Leading Working Foreman Motor Equipment Repairman Motor Equipment Maintenance Man	1 1 1	• Provides fleets maintenance services to the Department of Public Works, Police Department, School Maintenance Vehicles, and the Harbor master. • Responsible for the repair and upkeep of approximately 150 vehicles. • Provides both general and preventive maintenance for City vehicles. • Coordinates warranty work with vendors.

Function	Staffing By Classification		Roles and Responsibilities
Water Meters	Water Meter Reader Water Meter Installer	1 1	• Responsible for the maintenance, installation, and repair of approximately 1,100 City water meters. • Responsible for the monthly reading of water meters. • Responsible for the connect and disconnect of new water services. • Provides customer service calls for water customers regarding accounts.
Solid Waste Recycling	Recycling Coordinator	1	• Responsible for contract management of the solid waste collection contract (approximately $1.8 million per year). This includes investigation and resolution of customer complaints. • Responsible for managing the 'pay as you throw' program, which includes the distribution of stickers for household waste. • Coordinates annual hazardous waste and disposal of appliances programs.
Business Office	Bookkeeper Principal Account Clerk Senior Clerk	1 1 1	• Serves as the Department's financial / budget analyst. Key tasks include budget preparation and monitoring, receipt and processing of purchase requisitions, purchase orders and invoices, time and attendance reporting, and providing backup to the Water and Sewer Clerks. • Provides customer service with respect to water and sewer customers, as well as providing general DPW support (e.g., answer main telephone lines, route calls, take request for services, etc.). • Responsible for providing meter reading routes to Meter Readers, including download of routes into handhelds and uploading of results. • Reviews meter readings for quality control purposes. • Processes water and sewer bills. • Receive and process requests for service turn-ons and offs, including seasonal requests.

(3) Summary of Operations

The table below provides a summary of the services provided by each section.

Function	Description of Services and Key Workload
Business Office	• Responsible for the management of the Department's budget and processing of purchase orders. • Manages water and sewer accounts, including billing process. • Receives and process applications (e.g., turn ons/offs, new service, etc.).
Custodians	• Responsible for janitorial services and minor building maintenance issues (e.g., light bulb changes, restocking of paper goods, etc.).
Central Stores	• Responsible for overseeing the Department of Public Works' Central Stores Department. • Responsible for ordering and maintaining inventory levels for Departmental supplies and parts. • Does periodic inventory checks of stock inventory levels. • Maintains and monitors Gas Boy Fuel System for City. • Provides accounting records for inventory issues by department.
Vehicle Maintenance	• Provides fleets maintenance services to the Department of Public Works, Police Department, School Maintenance Vehicles, and the Harbor master. • Responsible for the repair and upkeep of approximately 150 vehicles. • Provides both general and preventive maintenance for City vehicles. • Coordinates warranty work with vendors.
Water Meters	• Responsible for the maintenance, installation, and repair of approximately 11,100 City water meters. • Responsible for the monthly reading of water meters. • Responsible for the connect and disconnect of new water services. • Provides customer service calls for water customers regarding accounts.
Solid Waste Recycling	• Responsible for management of the solid waste contract. • Distribute "pay as you throw" stickers.

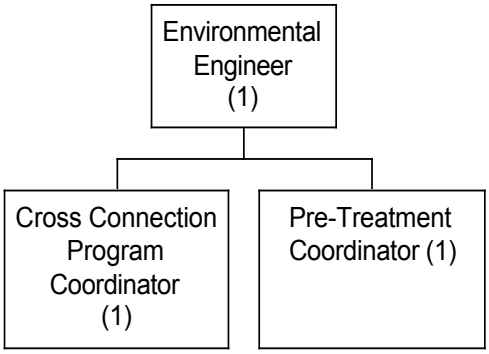
6. ENVIRONMENTAL ENGINEERING DIVISION

The Environmental Engineer is responsible for managing the Environmental Engineering Division including management of the activities related to the water and wastewater treatment plants. Both of these plants have been operated by contract since 1991 and 1984, respectively. The water treatment plants have a capacity of 5 million gallons per day (and an annual average of 3.5 MGD). There are three water treatment plants: one is seasonally operated and two have the 5 MGD capacity, and are rotationally operated. There is one wastewater treatment plant and 29 pump stations.

The plant is designed for a 7.24 MGD (with a peak capacity of 15 MGD), however, the City is permitted for 5.15 MGD discharge.

(1) Organization

The organization of this division is shown in the organizational chart below.



(2) Staff Roles and Responsibilities

The table, which follows, presents the roles and responsibilities for staff assigned to the Environmental Engineering Division.

Function	Staffing By Classification		Roles and Responsibilities
Environmental Engineering Division	Engineer	1	• Manages and directs the daily activities of the Environmental Engineering Division. • Plans and schedules work, as necessary. • Responsible for the day-to-day contract management of Water and Wastewater Treatment Plant contracts. • Responsible for procuring services for regulatory compliance (e.g., leak detection program, dam inspections, laboratory services, etc.). • Coordinates with the DPW Director and the City Engineer with respect to water and wastewater treatment planning. • Responsible for all State reporting. • Serves as liaison with all regulatory agencies and responsible for ensuring City compliance with all water and wastewater treatment regulations. • Responsible for personnel management of the Division, including interviewing and hiring of staff, performance evaluations, writing job descriptions, etc.

Function	Staffing By Classification		Roles and Responsibilities
Environmental Engineering Division	Pre-Treatment Coordinator	1	• Responsible for managing the City's industrial pre-treatment program, including fats, oil and grease program (FOG). • Responsible for granting permits, conducting samples, site inspections and enforcement. • Permits all food service establishments. • Inspects manholes. • Issues industrial user discharge permits, conducts site inspections, compliance sampling and tracks permit requirements. There are 17 permitted facilities in the City. • Prepares all correspondence to permitees, including notices of violations. Assesses penalties, if warranted.
Environmental Engineering Division	Cross Connection Inspector	1	• Responsible for establishing and monitoring the City's cross connection program and establishing new procedures as appropriate. • Performs testing of backflow device testing. • Identifies facilities and businesses for which a backflow prevention device is required. • Maintains database of backflow devices. • Responsible for the testing and installation of backflow prevention devices (twice annual testing). • Prepares correspondence including notices of violations. • Responsible for the hydrant permit program and maintaining hydrant location information. • Responsible for the public education program for cross connections, which includes businesses and residential contacts. • Responsible for monitoring the reservoirs and conducting dam inspections. • Responsible for sampling reservoirs for compliance with Mass Highway No Salt Zone program. • Responds to residents' concerns about water quality.
Environmental Engineering Division	Principal Clerk	1	• At the time of the study, this position was newly authorized and had not been filled. • Position created to provide administrative support to the Division, including processing and tracking of data.

This Division is authorized three staff.

(3) Summary of Operations.

The table below provides a summary of the services provided by the Division.

Function	Description of Services and Key Workloads
Environmental Engineering	• Responsible for contract oversight of the water and wastewater treatment plants. • Responsible for the industrial pretreatment program. • Responsible for the cross-connection / backflow prevention program.

3. COMPARATIVE SURVEY

3. COMPARATIVE SURVEY

As part of the management study of Public Works Department, the project team conducted a comparative survey of the Public Works Departments of other local governments regarding their overall organization, processes and operations.

The project team's survey instrument was designed to collect data regarding key functions including engineering, street maintenance, water distribution, and wastewater collection. The project team contacted eleven local governments. However, responses were received from five local governments. The local governments that responded included the following:

- Falmouth;
- Easton;
- Beverly;
- North Kingstown; and
- Worcester.

The sections, which follow, present a review of the information provided by the responding local governments.

1. GENERAL DEPARTMENT INFORMATION

This section provides a review of general data relating to each public works operation, including total staffing, operating budgets, automated information systems, etc.

	Gloucester	Falmouth	Easton	Beverly	North Kingstown	Worcester
Total Number of FTE's	71.5	95	37	40	37	502
Total FY 2007 Operating Budget	$16M	$10 Million	$4.8 Million	$14.64 Million	$4.8 Million	$61 Million
Enterprise Supported Operations	Water, Sewer	No	Water	Water, Sewer	No	Water, Sewer, Golf
Automated Maintenance Management Systems	No	No	No	Tried Cartegraph, Use Excel and Access	No	Yes

The points, presented below, provide a discussion of the information presented in the table.

- Gloucester, Falmouth and Worcester public works departments provide a full range of services including streets maintenance, engineering, facilities, management, water distribution, wastewater collection, fleet maintenance, etc.

- Easton and North Kingstown's public works departments do not provide water and sewer services.

- Falmouth does not operate an enterprise fund for its water and wastewater functions; whereas, Easton, Gloucester, and Worcester operate their water and sewer operations as enterprise funds.

- Only one survey participant supported their operations with an automated maintenance management system: Worcester.

- The average expenditure per full-time equivalent for the local governments was $92,053 below the average for the City of Gloucester, which was at $226,282.

	Gloucester	Falmouth	Easton	Beverly	North Kingstown	Worcester
Total Number of FTE's	71.5	95	37	40	37	502
Total FY 2007 Operating Budget	$16M	$9.98 Million	$4.8 Million	$14.64 Million	$4.8 Million	$61 Million
Expenditures / FTE	$226,282	$105,096	$130,810	$366,000	$132,210	$121,674

The section, which follows, presents a summary of the results regarding street maintenance functions.

2. STREET MAINTENANCE

The project team collected information from the participating communities with respect to street maintenance functions. Information included staffing, services, contract service, street sweeping, and snow removal.

The table and points, which follow, presents the results with respect to street maintenance staffing, crew size, and contract services.

City	No. of Staff	No. of Lane Miles	FTE Staff Per 100 Lane Miles
Gloucester	12	182	6.59
Easton	9	288	3.13
Falmouth	19	218	8.72
North Kingstown	16	210	7.62
Worcester	25	883	2.83
Beverly	11	371	2.96

The following points present a discussion of information collected regarding street maintenance in each of the local governments.

- As shown in the table above, the number of staff per 100 lane miles ranged from a low of 2.83 lane miles in Worcester to a high of 8.72 miles per FTE in Falmouth. Gloucester's level of staff per 100 lane miles is lower than Falmouth and North Kingston, but higher than that of Easton, Worcester, and Beverly.

- As compared to Gloucester, most of the local governments contracted out similar street maintenance work, including paving, crack sealing and overlay as well as sidewalk repair and construction.

- Gloucester targets a three-year cycle on street inspections as part of the pavement management system, while North Kingstown targets a five-year cycle, Worcester targets a seven-year cycle, and Falmouth targets a four-year cycle.

- Falmouth, North Kingstown and Worcester's average turnaround time for potholes to be patched after a complaint is received is within 1 business day. The town of Easton's average turnaround time is within four hours. Gloucester and Beverly's goal is to fill potholes within two to three days.

- All of the local governments have implemented a crack-sealing program, which is performed by contract. Gloucester has tried this in the past but informs Matrix that the results were not positive.

- Gloucester has similar snow plowing practices as the comparative agencies. All local governments dedicate City staff to snow plowing, as well as utilize a mix of in-house staff from different divisions and contractors.

- The level of street sweeping service provided by Gloucester, as indicated in the table below, is comparable to these other local governments although Falmouth and Beverly provide a higher level of service for commercial street sweeping and for residential street sweeping as well.

City	Frequency of Residential Streets	Frequency of Commercial Districts
Gloucester	Once per Year	31 times per year or once per week during the eight month sweeping season
Easton	Once per Year	N/A
Falmouth	Once per Year	Twice weekly
North Kingstown	Once per Year	N/A
Worcester	Twice per Year	Once weekly
Beverly	Three per Year	Twice per week

Overall, Gloucester provides similar types and levels of services as the other local governments. However, while Gloucester outsources similar maintenance services, its street maintenance staffing levels per 100 lane miles are higher than that of Easton, Worcester, and Beverly.

3. FLEET MANAGEMENT

This section of the comparative survey presents comparisons regarding fleet maintenance services. Local governments were asked to provide information relating to staffing, fleet sizes, hours of operation, etc. The table, which follows, presents the results.

	Gloucester	Easton	Falmouth	North Kingstown	Worcester	Beverly
Number of FTE's	3	2	3	3	21	4
Fleet maintained by Fleet Services	Yes, except fire	Yes, except fire	General municipal operations, excluding police and fire	No	No Just DPW&P	All but school and fire

	Gloucester	Easton	Falmouth	North Kingstown	Worcester	Beverly
Fleet Size	155	136	118	60	523	200
Hours of Operation	7AM to 3 PM	7AM to 3 PM	7AM to 3 PM	7AM to 3 PM	7 AM to 12 AM	7:30 to 3:30
Automated Fleet Management System	No	No	No	Yes- RTA	No	Access Database
Operating departments are charged back for fleet services	No	Yes	No	Yes	Yes	All but labor is charged back to department
Percentage of preventive maintenance completed according to schedule	Unknown	95%	Unknown	N/A	90%	Unknown
Percentage of services are scheduled repairs versus unscheduled repairs	Unknown	90%	Most unscheduled	N/A	80% Unscheduled	50/50

The points, which follow, discuss the information presented in the table.

- For the most part, fleet services functions provide fleet maintenance and repair services for Department fleet only. However, Easton has a centralized fleet shop that provides services to all municipal departments except for the Fire Department. Gloucester maintains general fleet, excluding fire.

- For the comparative local governments, the median number of fleet units per dedicated fleet staff is 39 while Gloucester was at 51. The table, below, presents the number of fleet units per dedicated fleet personnel for each responding agency.

City	No. of Staff	Fleet Size	Units per FTE
Gloucester	3	155	51
Easton	2	136	68
Falmouth	3	118	39
North Kingstown	3	60	20
Worcester	21	523	25
Beverly	4	200	50

- All fleet service shops are open during normal Public Works Department hours of operation except Worcester, which is open from 7 a.m. to 12 a.m.

- Only North Kingstown utilized an automated fleet maintenance management system.

- Gloucester and Falmouth do not charge back operating departments for repair and maintenance services unlike the other comparative local governments.

- Easton and Worcester complete 95% and 90%, respectively, of their preventive maintenance according to schedule. Additionally, in Easton approximately 90% of services are scheduled and in Worcester 80% of services are scheduled.

With respect to fleet supported and the hours of operation of fleet services, Gloucester's practices and operations are similar to the comparative local governments. Gloucester's fleet services operation does not change back the cost of maintenance and repair to operating departments.

4. WATER

Comparative agencies were also asked to provide information regarding their water operations. The table, which follows, provides the results for water.

Agency	Gloucester	Easton	Falmouth	Worcester	Beverly
No. of staff	11	23	19	50	7
No. of miles of water mains	150	157	376	600	160
Percentage of unaccounted water	22.23%	10.5%	18%	18%	9%
Frequency of distribution valves to be exercised	No Program	No Program	No Program	N/A	Do not operate regularly
Frequency for water storage tank inspection and cleaning	Every 5 years	Every 5 Years	Every 5 Years	Every 5 Years	5 years
Utilization of in-house staff to dig up and replace water mains (excluding minor main replacement associated with leaks) or contractors.	Yes	Yes	Yes	Contractors	Both

The points, which follow, provide a discussion of the information presented in the table.

- The number of miles of water mains per full-time equivalent for water operations ranged from a low of 6.8 (Easton) to a high of 22.9 miles per FTE (Falmouth). Gloucester was only slightly above Easton at 7.3 miles per technician. The table, below, presents the results.

Local Government	No. of Staff	Miles of Water Mains	Miles per FTE
Gloucester	11	150	13.6
Easton	23	157	6.8
Falmouth	19	376	19.8
Worcester	50	600	12
Beverly	7	160	22.9

- Gloucester came in well above the average in terms of the percentage of unaccounted water realized by the comparable cities. The average percentage was 13.88% for the comparable entities while Gloucester came in at 22.23%. It should be noted that the City of Gloucester has a lead detection program which is performed by contract every two years. The lowest rate for unaccounted water was 9%.

- None of the local governments had a formal program in place for exercising valves.

- All four of the local governments surveyed targeted water storage tank inspection and cleaning on a five-year cycle.

- Easton and Falmouth utilize in-house staff to dig up and replace water mains. Worcester only utilizes contractors for this. Gloucester utilizes in-house staff to dig up and replace water mains.

The section, which follows, presents a summary of the results with respect to Sewer Operations.

5. WASTEWATER COLLECTION

The Matrix Consulting Group collected comparative information regarding wastewater operations, including staffing, operations, and maintenance programs. The points, which follow, provide a summary of the results.

- Gloucester maintains approximately 78 miles of sewer mains with approximately 8 full-time employees or 9.75 miles per staff. Falmouth has 8 FTE's assigned to approximately 19 miles of sewer mains. Beverly had approximately 83 miles of sewer main for each staff. Worcester has approximately 600 miles of sewer mains for its 50 FTE's assigned to wastewater operations.

- Gloucester and Beverly do not have routine programs to ensure the cleaning of the sewer system. Falmouth estimates that 80% of its sewer lines are cleaned annually (or a 1.2 year cycle) compared to Worcester that cleans its sewer collection system on a 10-year cycle.

- Gloucester utilized both City staff and contractors to dig up and replace sewer mains as does Worcester. Falmouth typically utilizes contractors to dig up and replace sewer mains.

Overall, Gloucester provides similar programs and services as do the comparative local governments. Additionally, the scope of programs are similar with respect to services performed in-house versus contracted. However, there are some areas in which Gloucester falls outside of the comparative data, including charge back of fleet service costs, ratio of street maintenance personnel to street miles, ratio of water personnel to miles of water mains, unaccounted water, and the ability to track certain data (e.g. scheduled versus unscheduled repairs), etc.

4. MAJOR CONTACTS

4. MAJOR CONTACTS

As part of the Organization and Management Study of the Public Works Department, the Matrix Consulting Group interviewed several key personnel in order to obtain a better understanding of the functional responsibilities of each division within the Department of Public Works. According to section 7-12 of the City Charter concerning Management Audits, a detailed listing of key personnel interviewed must be identified. Below is an inventory of the personnel interviewed.

Staff Name	Staff Title
Joe Parisi	Public Works Director
Joseph Pratt	City Auditor
David Knowlton	City Engineer
George Fletcher	Sewer Foreman
Jay Fletcher	Highway Foreman
Ron Garvey	Fleet Foreman
Dan Smith	Central Services Manager
Keith Keating	Operations Manager
Mark Cole	Public Properties Manager
Frank Saunders	Water Foreman
Richard Clark	Assistant City Engineer
Aaron Ciluffo	Assistant City Engineer
Michael Hale	Civil Engineer
Peter Dennen	Public Properties Foreman
Frank Ventimigilia	Jr. Civil Engineer
Linda Anderton	Administrative Assistant
Christine Millhouse	Environmental Engineer
Warren Coleman	Central Stores Clerk
Frank Benson	Sr. Building Maintenance
Shirley Henderson	Bookkeeper
Karen Andrews	Engineering Aide
Robin Davis	Clerk
Sandra Tarr	Senior Clerk
Karen Morris	Clerk
Donna Leete	Personnel Director

5. EMPLOYEE SURVEY

5. EMPLOYEE SURVEY

The Matrix Consulting Group conducted a survey of employees of the Public Works Department for organizational, operational, and other issues within the Department. This survey was conducted as part of the Management Study of the Public Works Department. Surveys were distributed to all Public Works Department employees. The responses rate for the survey was 41%, lower than typically experienced by the project team. The points, which follow, provide a description of the survey instrument.

- While the survey was confidential, respondents were asked to indicate their assignment in the Public Works Department. The table, below, presents the number and percentage of respondents by Division.

Current Assignment	No. of Respondents	% of Total Responses
Administration	1	3%
Central Services	5	17%
Engineering/ Environ.	5	17%
Water	4	13%
Sewer	1	3%
Highway	7	23%
Public Properties	5	17%
Unknown	2	7%
TOTAL	**30**	**100%**

- The survey contained thirty-eight statements to which respondents were asked to select one of the following responses: “no opinion,” “strongly agree,” “agree,” “disagree,” and “strongly disagree.” For purposes of analysis, each response was assigned a number; the lower the number the more positive the response.

- The statements were designed to provide a better understanding of the perceptions, attitudes, and opinions of the Public Works Department employees with respect to several key areas. The following points present a discussion of those sections.

  – Level and quality of service: The employee questionnaire included several statements regarding level and quality of services provided by the Public Works Department, as well as their Divisions.

- – General administrative operations: Respondents were asked to evaluate statements relating to policies and procedures, employee disciplinary process, as well as accountability for performance.

- – Appropriate tools and equipment: The survey included statements relating to the appropriateness of current resources provided to staff.

- – Staffing: Employees were asked to evaluate statements relating to staffing and workload in the Department of Public Works.

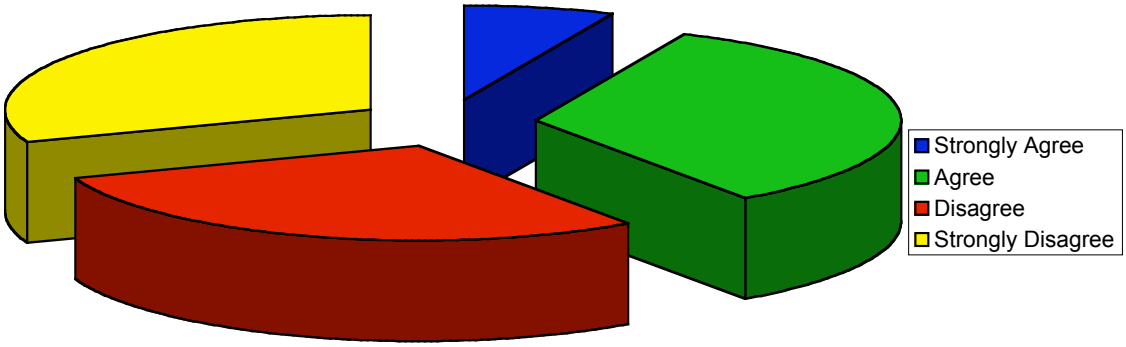
- Additionally, the employee survey included two open-ended statements, which asked respondents to identify the strengths of the Department of Public Works, as well as opportunities for improvement within the Department.

The section, which follows, presents a brief overview of the results of the employee survey. Provided at the end of this chapter are the detailed results for the survey, which includes actual responses for each statement included in the employee survey.

1. GENERAL FINDINGS

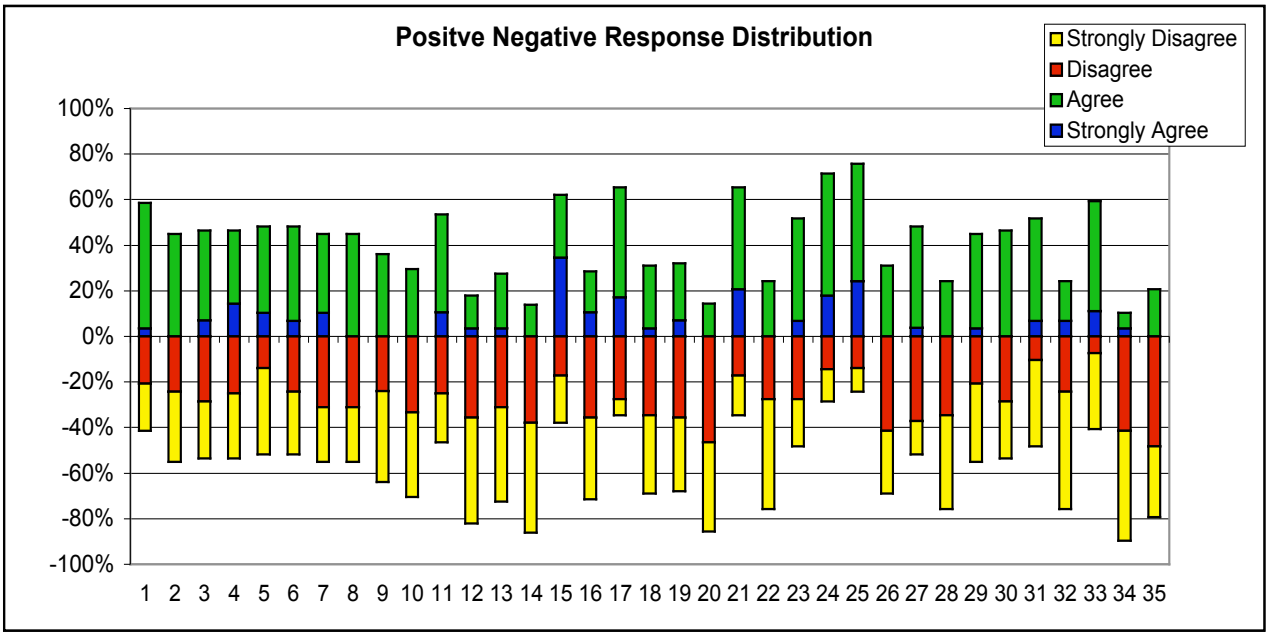
In reviewing the results to the quantitative responses in the first section of the resident and intern survey, it is important to look at the pattern of responses for the entire group versus individual responses. The chart below summarizes the overall distribution of responses to statements to which employees were asked to select a response. It should be noted that the chart does not include responses where the employees selected “no response,” did not make a selection, or selected “neutral.”

Overal Response Distribution



As the above chart illustrates, responses were mixed with 40% of responses either “strongly agree” (7%) or “agree” (33%). On the other hand, approximately 29% of responses were “strongly disagree” and 31% were “disagree.”

To gain a more detailed sense of the responses from the statements by general topic of the employee survey (e.g., customer service, management and organization, workload, etc.), it is useful to look in greater detail at the topics that elicited the strongest positive and negative responses. The chart, found below, plots the number of responses that were positive, and responses that were negative for each statement.

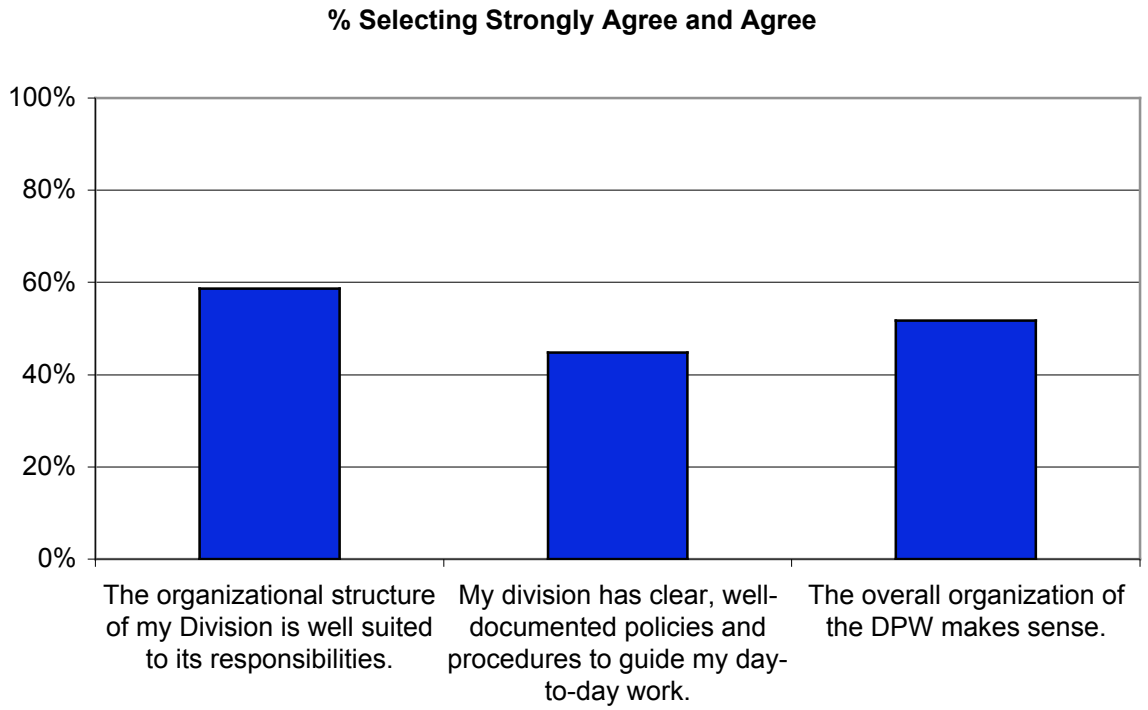


As noted, the chart above presents the positive – negative distribution of responses by statement. As the previous chart shows, the overall responses were mixed. The positive – negative response distribution chart shows that there were statements to which respondents had positive attitudes, as well as some statements to which respondents had negative perceptions.

The sections, which follow, provide a detailed discussion of the results of the employee survey for each of the topic areas as identified.

2. RESPONDENTS WERE PROVIDED STATEMENTS RELATING TO GENERAL ADMINISTRATIVE OPERATIONS, INCLUDING STRUCTURE AND MANAGEMENT SYSTEMS.

The employee survey included statements regarding management structure and systems. Respondents were asked to evaluate statements by selecting "strongly agree," "agree," "disagree," or "strongly disagree." The chart, which follows, presents the percentage of respondents selecting "strongly agree" and "agree."



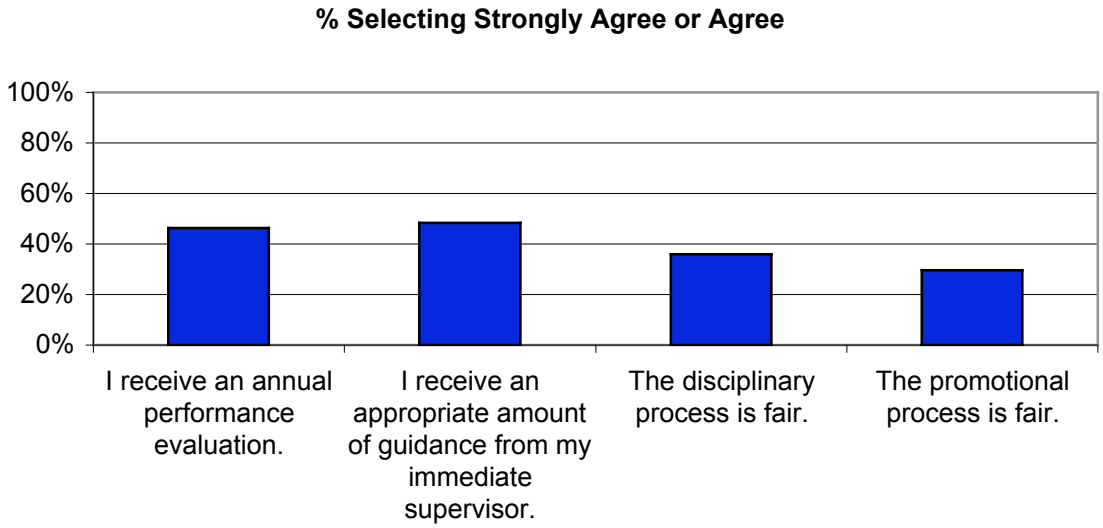
The points, below, present a discussion of the information provided in the chart.

- In response to the statement, 'the organizational structure of my Division is well suited to its responsibilities,' 59% selected 'strongly agree' or 'agree.'

- Slightly less than half (45%) of respondents selected 'strongly agree' or agree' in response to the statement, 'my division has clear, well-document policies and procedures to guide my day-to-day work.'

- When provided the statement, 'the overall organization of the DPW makes sense,' 52% selected 'strongly agree' or 'agree.'

The employee survey provided statements relating to management systems utilized in the Public Works Department. The chart, which follows, provides the results.



The points, below, present the results for each statement included in the above chart.

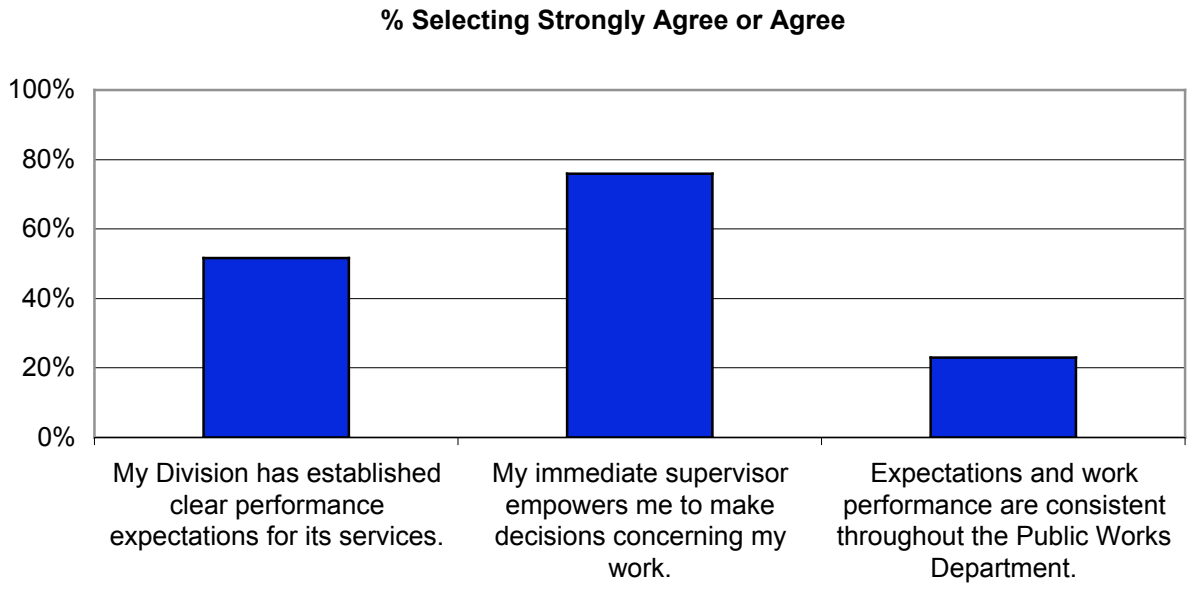
- When provided the statement, 'I receive an annual performance evaluation,' 46% of respondents selected 'strongly agree' or 'agree.'

- Slightly less than half (48%) of respondents selected 'strongly agree' or 'agree,' in response to the statement 'I receive an appropriate amount of guidance from my immediate supervisor.'

- Approximately 36% of respondents evaluating the statement, 'the disciplinary process is fair' positively. Over 60% selected 'disagree' or 'strongly disagree' in response to the statement.

- Slightly fewer respondents (30%) positively evaluated the statement 'the promotional process is fair.' Additionally, 70% of respondents selected 'disagree' or 'strongly disagree.'

The following charts presents the results with respect to statements regarding expectations, work performance, etc.



The following points provide a summary of the results for the above statements.

- With respect to the statement, 'my division has established clear performance expectations for its services,' 52% of respondents selected 'strongly agree' or 'agree.'

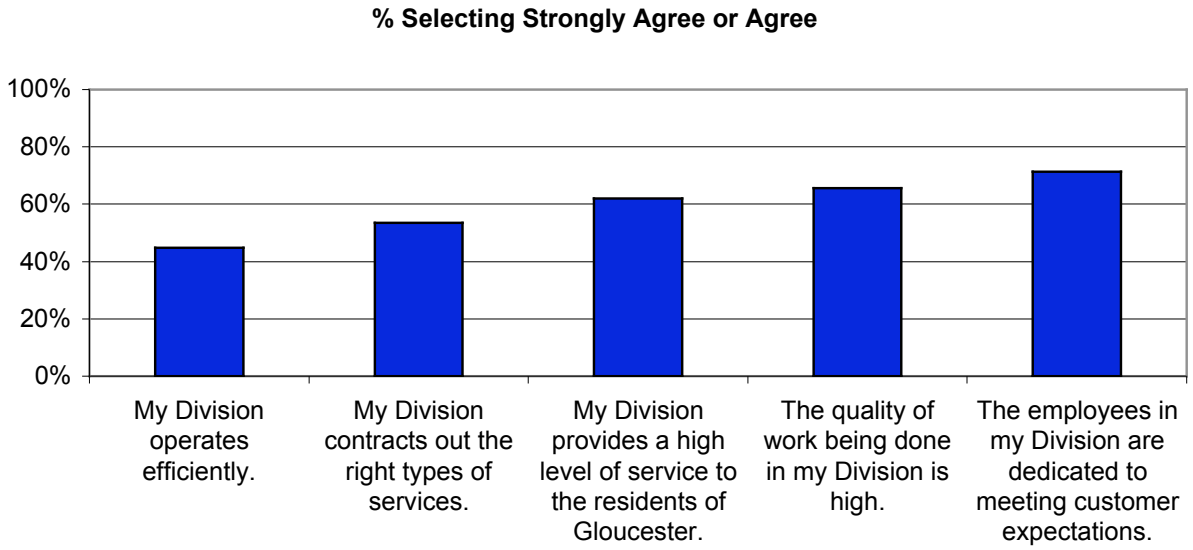
- In response to the statement, 'my immediate supervisor empowers me to make decisions concerning my work,' 76% selected 'strongly agree' or 'agree.'

- On the other hand, 10% of respondents selected 'strongly agree' or 'agree' in response to the statement 'expectations and work performance are consistent throughout the Public Works Department,' while 90% of respondents selected 'strongly disagree' or 'disagree.'

Overall, respondents had mixed perceptions with respect to management structure and systems in the Public Works Department.

3. RESPONDENTS WERE ASKED TO EVALUATE STATEMENTs ABOUT THE LEVEL AND QUALITY OF SERVICES PROVIDED BY THE DEPARTMENT OF PUBLIC WORKS.

The employee survey included statements regarding the level and quality of services provided performed by the Public Works Department. The chart, which follows, presents a summary of the results.



The points, which follow, provide a brief discussion of the results of the above statements.

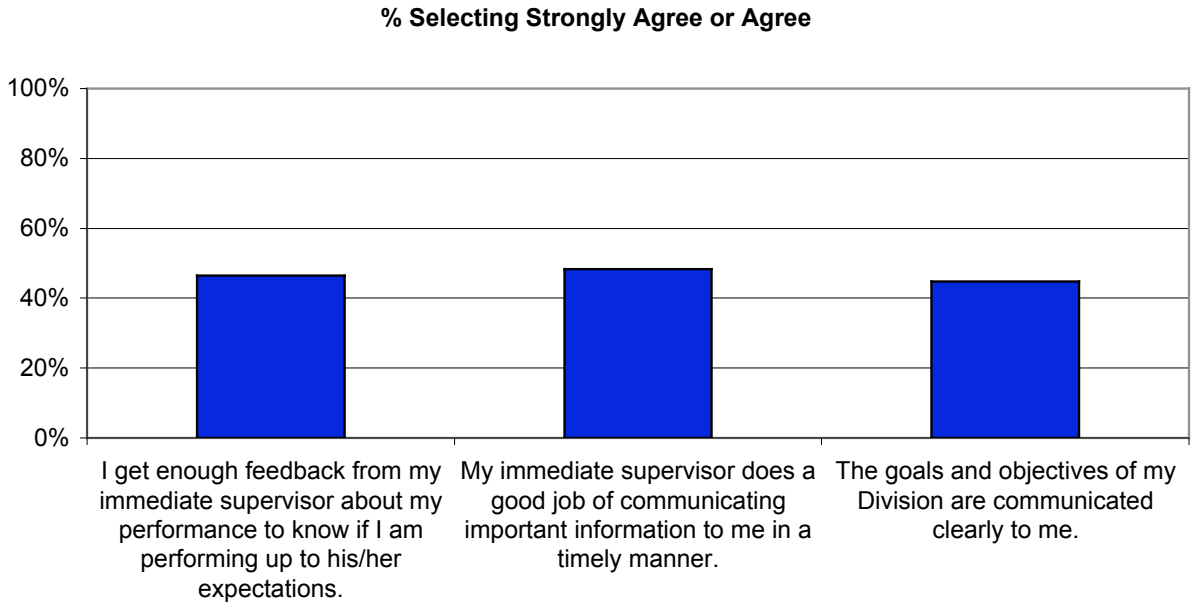
- With respect to the statement, 'my division operates efficiently' 45% selected 'strongly agree' or 'agree.'
- In response to the statement, 'my division contracts out the right types of services,' 54% selected 'strongly agree' or 'agree.'
- When provided the statement, 'my division provides a high level of services to the residents of Gloucester,' 62% of respondents selected 'strongly agree' or 'agree.'
- In response to the statement, 'the quality of work being done in my Division is high,' 66% of respondents selected 'strongly agree' or 'agree.'

- With regard to the statement, 'the employees in my Division are dedicated to meeting customer expectations,' 71% of respondents selected 'strongly agree' or 'agree.'

Overall, respondents viewed positively statements regarding the level and quality of services provided by the Department.

4. RESPONDENTS EVALUATED STATEMENTS REGARDING COMMUNICATION AND COORDINATION.

The employee survey included statements regarding internal communication among staff, as well as divisions, and coordination between the various divisions in the Public Works Department. The chart, which follows, provides the results for statements relating to supervisory communication.



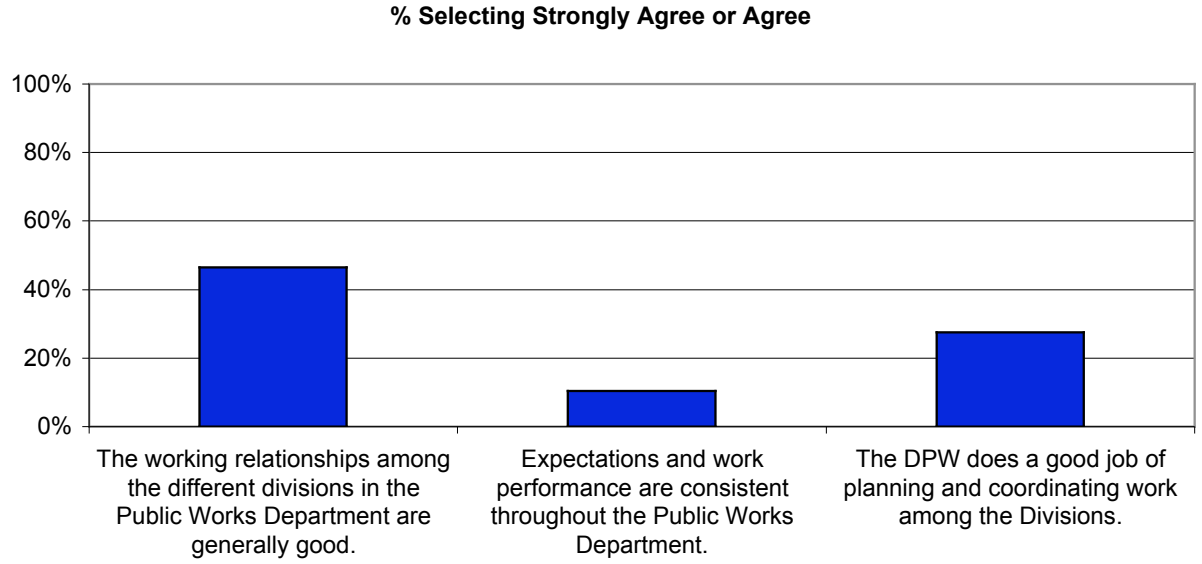
The points, below, present a summary of the information provided in the chart.

- In response to the statement, 'I get enough feedback from my immediate supervisor about my performance to know if I am performing up to his/her expectations,' 46% of respondents selected 'strongly agree' or 'agree.'

- When provided the statement, 'my immediate supervisor does a good job of communicating importation information to me in a timely manner,' 48% of respondents selected 'strongly agree' or 'agree.'

- With respect to the statement, 'the goals and objectives of my division are clearly communicated to me,' 45% if respondents selected 'strongly agree' or 'agree.'

Overall, respondents viewed supervisory communication positively. The chart, which follows, presents the results with respect to statements about internal coordination.



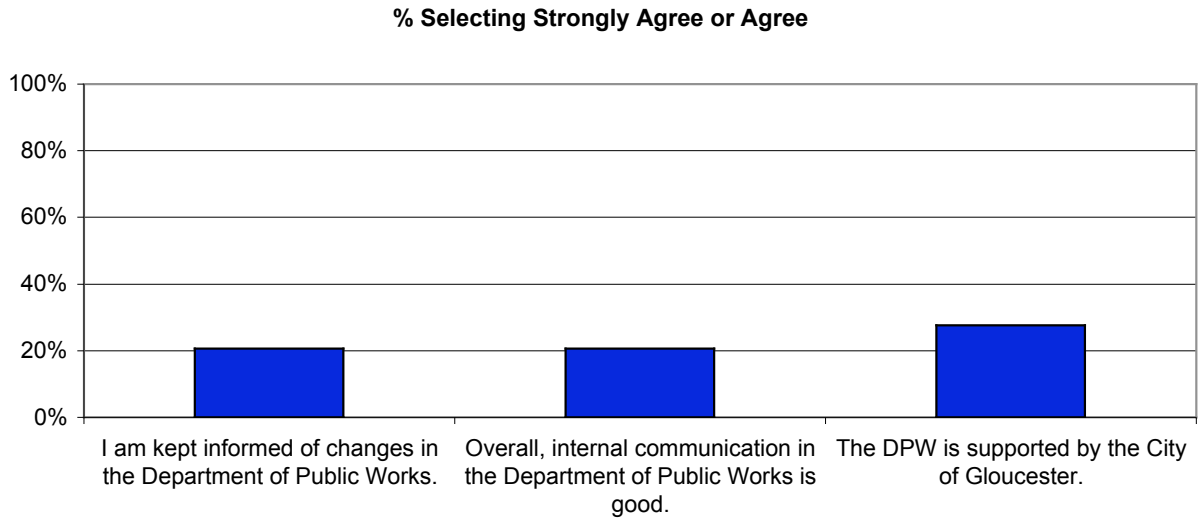
The points, below, present the results for each statement.

- In response to the statement, 'the working relationships among the different divisions in the Public Works Department are generally good,' 46% of respondents selected 'strongly agree' or 'agree.'

- With respect to the statement, 'all divisions in the DPW are held to the same standards,' 10% of respondents selected 'agree,' while 90% selected 'strongly disagree' or 'disagree.'

- Similarly, 28% of respondents selected 'agree' in response to the statement 'expectations and work performance are consistent throughout the Public Works Department.'

The chart, below, presents respondents' perceptions with respected to overall internal communication in the Public Works Department and the City.



The points, which follow, present the survey results for the above statements.

- In response to the statement, 'I am kept informed of changes in the Department of Public Works,' 21% of respondents selected 'strongly agree' or 'agree' while 79% of respondents selected 'strongly disagree' or 'disagree.'

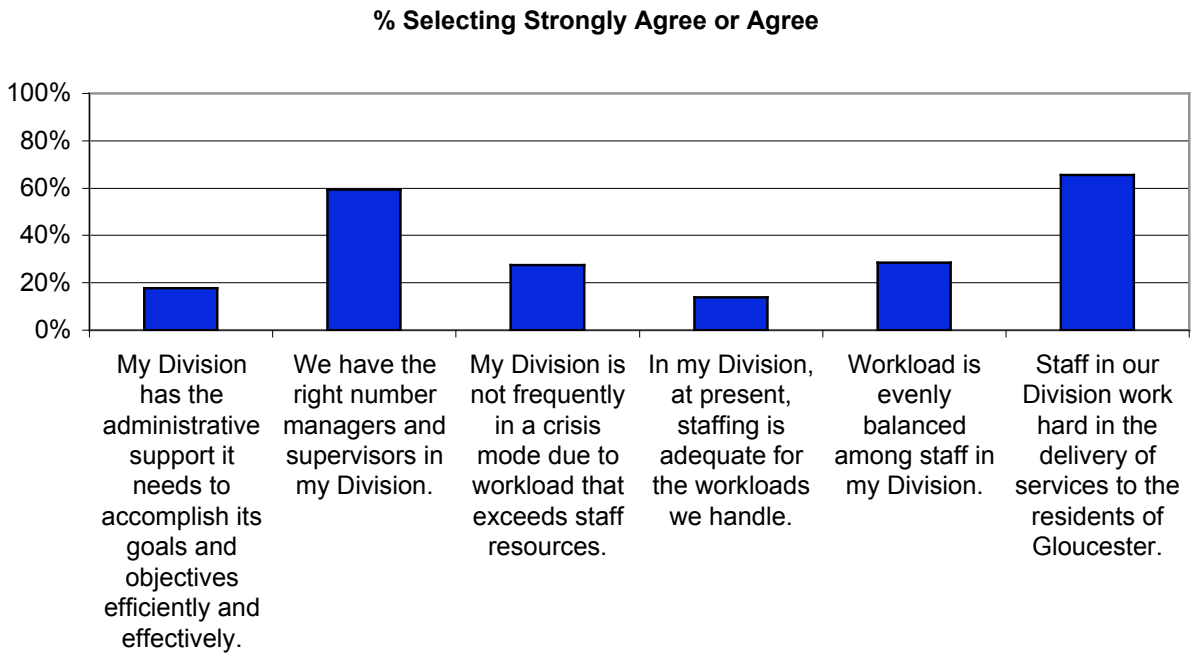
- When provided the statement, 'overall internal communication in the Department of Public Works is good,' 21% of respondents selected 'strongly agree' or 'agree.'

- With respect to the statement, 'the DPW is well supported by the City of Gloucester,' 24% of respondents selected 'strongly agree' or 'agree.'

Respondents had mixed perceptions with respect to internal communication and coordination in the Public Works Department. The section, which follows, presents the results with respect to statements regarding staffing and workload.

5. RESPONDENTS WERE PROVIDED STATEMENTS RELATING TO WORKLOAD AND STAFFING.

Respondents were asked to evaluate statements regarding workload and staffing. The chart, on the page, which follows, presents the results.



The points, which follow, provide a discussion of the results.

- In response to the statement, 'my Division has the administrative support it needs to accomplish its goals and objectives efficiently and effectively,' 18% selected 'strongly agree' or 'agree.'

- When provided the statement, 'we have the right number of managers and supervisors in my Division,' 59% of respondents selected 'strongly agree' or 'agree.'

- With respect to the statement, 'my Division is not frequently in crisis mode due to workload that exceeds staff resources,' 28% of respondents selected 'strongly agree' or agree.'

- Respondents had mixed perceptions with respect to the statement, 'in my Division, at present, staffing is adequate for the workloads we handle,' with 14% selecting 'agree' and 86% selecting 'strongly disagree' or 'disagree.'

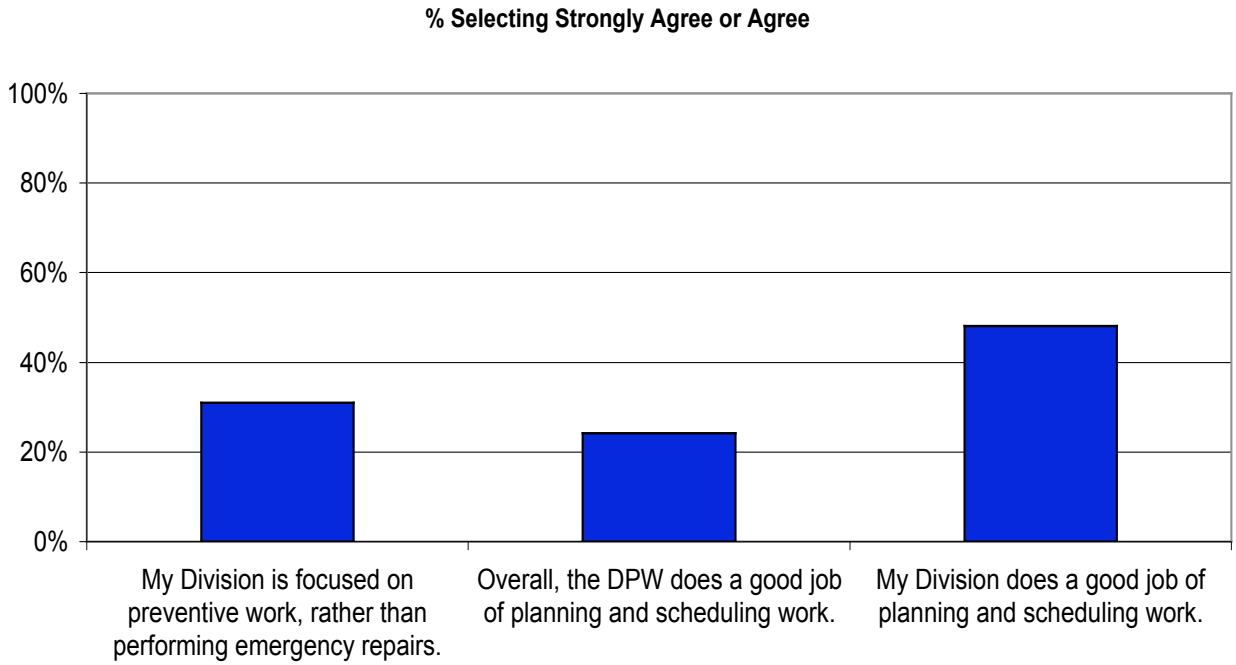
- In response to the statement, 'workload is balanced among staff in my Division,' 29% of staff selected 'strongly disagree' or 'disagree.'

- When provided the statement, 'staff in our Division work hard in the delivery of services to the residents of Gloucester,' 66% of the respondents selected 'strongly agree' or 'agree.'

Staff had mixed perceptions with respect to staffing and workload in their divisions.

6. RESPONDENTS WERE PROVIDED STATEMENTS REGARDING THE PLANNING AND SCHEDULING OF WORK.

The employee survey included statements regarding the work environment in the Public Works Department. The chart, which follows, presents the results for each statement.



The points, below, present a brief discussion of the results of the employee survey with respect to statements about work environment.

- When provided the statement, 'my Division is focused on preventive work, rather than performing emergency repairs,' 31% of respondents selected 'strongly agree' or 'agree.'

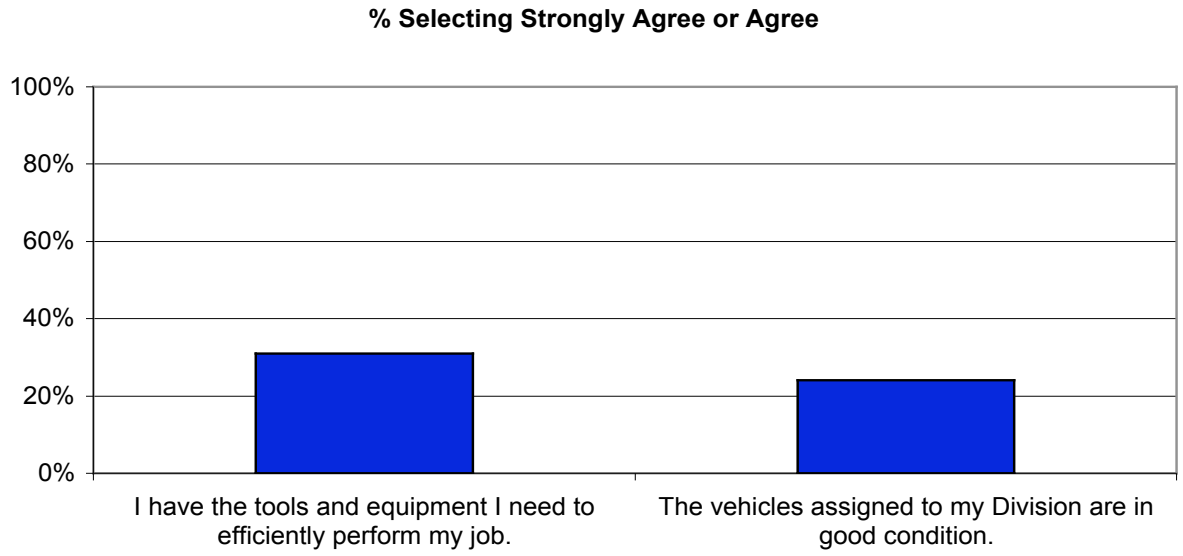
- In response to the statement, 'overall, the DPW does a good job of planning an scheduling work,' 24% of respondents selected 'strongly agree' or 'agree.'

- With respect to the statement, my Division does a good job of planning and scheduling work,' 48% of respondents selected 'strongly agree' or 'disagree.'

Overall, respondents had mixed views regarding the work environment in the Public Works Department. The section, which follows, presents a review of the results with respect to tools, training and equipment.

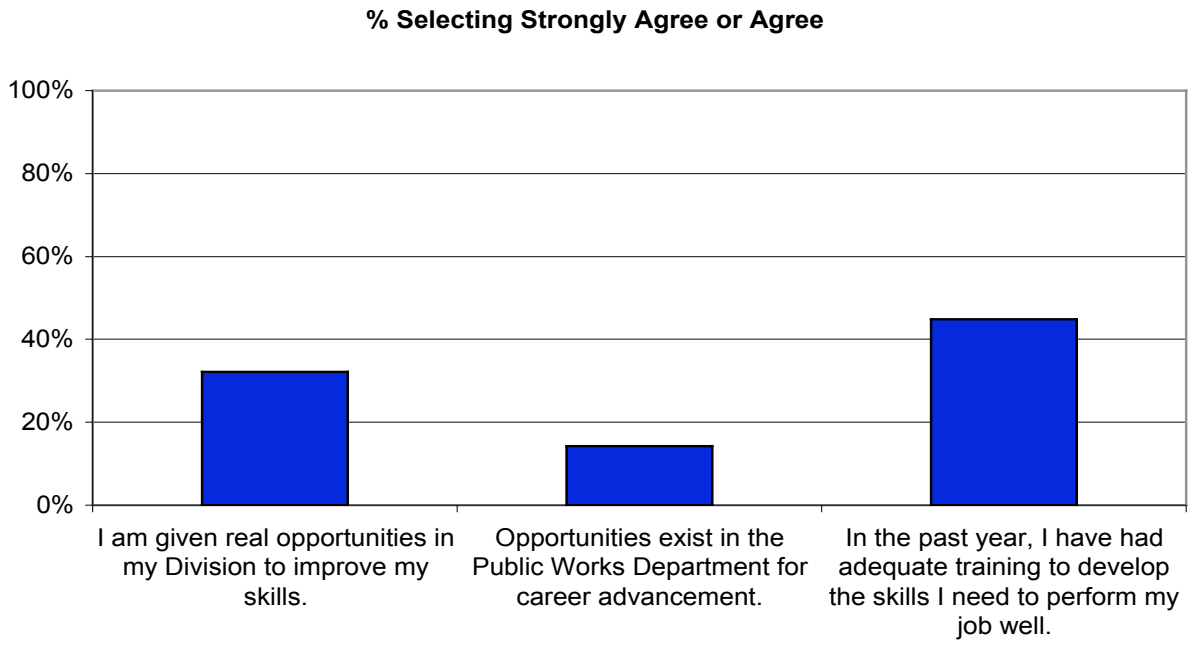
7. RESPONDENTS EVALUATED STATEMENTS REGARDING TOOLS, EQUIPMENT AND TRAINING.

Respondents were asked to evaluate statements regarding tools, equipment and training in the Public Works Department. The chart, below, presents the results with respect to tools and equipment.



As shown in the table, 31% of respondents selected 'strongly agree' or 'agree' in response to the statement, 'I have the tools and equipment I need to efficiently perform

my job.' Additionally, 24% of respondents selected 'strongly agree' or 'agree' in response to the statement, 'the vehicles assigned to my Division are in good condition.' The chart, below, presents the results with respect to statements about training.



The points, which follow, provide a discussion of the results of the survey.

- In response to the statement, 'I am given real opportunities in my Division to improve my skills,' 32% of respondents selected 'strongly agree' or 'agree.'

- With respect to the statement, 'opportunities exist in the Public Works Department for career advancement,' 14% of respondents selected 'strongly agree' or 'agree.'

- Respondents positively evaluated the statement, 'in the past year, I have had adequate training to develop the skills I need to perform my job well,' with 45% of respondents selecting 'strongly agree' or 'agree.'

Overall, employees had mixed views regarding tools and equipment, and training and skills development in the Public Works Department.

6. ANALYSIS OF ADMINISTRATION

6. ANALYSIS OF ADMINISTRATION

This chapter presents an analysis of the Administration Division of the Public Works Department. This analysis includes the following:

- A strategic plan;
- Goals, objectives, and performance measures;
- A long-term information technology plan;
- An effective asset management plan;
- The use and application of technology;
- The use and application of customer satisfaction surveys;
- The support staff for managers and supervisors;
- A training needs assessment for staff;
- The development of a policy and procedures manual and employee handbook;
- The development of a more formalized safety program;
- An employee recognition program.

The chapter opens with an analysis of strategic planning for the Department.

1. A NUMBER OF BEST PRACTICES FOR EFFECTIVE MANAGEMENT CONTROLS IN PUBLIC WORKS DEPARTMENTS WERE IDENTIFIED.

Good management systems and controls can help the Public Works Department provide safe, reliable infrastructure and services. The project teams' review of industry publications, the *Public Works Management Practices Manual,* standards developed by the American Water Works Association, the Water Environment Research Foundation, other professional associations, and discussions with management of the Public Works

Department indicates that critical components of good maintenance management should include a number of elements, as follows.

(1) A Comprehensive Maintenance Plan

The adoption of a comprehensive maintenance plan is essential to the effective operation of public works infrastructure. The plan should establish overall maintenance goals, standards for the amount and frequency of work, and maintenance priorities. By defining the amount of maintenance effort that will be conducted, resource requirements can be more precisely estimated. The plan should identify long-term capital replacement needs, estimate the life of the infrastructure assets, and focus efforts on the most important maintenance tasks. The comprehensive plan should also provide benchmarks against which to measure the performance of the maintenance program in addressing goals and standards.

(2) Written Maintenance Policies and Procedures

Written maintenance policies and procedures provide specific guidance on how to carry-out the maintenance plan and perform activities such as hydrant flushing, valve management, and water main replacement. Written policies and procedures should be used to train new staff, ensure maintenance work is correctly and consistently performed, and improve productivity of work crews. Written policies and procedures also provide standards for judging the quality of maintenance work and guidance to contract work crews.

(3) Reliable, Easily Accessible Information on Assets

According to the American Water Works Association, the "collection and management of information is a key element in the successful operation of a water

system. Information is the necessary link between the maintenance, operation and design aspects of water distribution system management." Reliable information on the nature, function, location, age, and condition of system assets is needed to ensure effective communication and coordination within the organization; to plan, carry out, and manage maintenance and repair work; and to plan capital improvements and replacements. Up-to-date information in the form of maps and data must be readily accessible to all employees and is most effective when fully integrated into an electronic maintenance management system.

(4) Methods For Organizing and Scheduling Work

The Public Works Department also requires efficient methods for organizing staff resources in work units and scheduling work crews. A centralized asset management system should be used to prioritize, assign and track the status of assigned work. Managers can control job costs by monitoring the time and costs of specific job requests and reduce duplicative efforts. This system is also most effective when integrated into geographic information systems.

(5) Performance Goals and Monitoring

Effective management systems should also provide information so managers can actively monitor and measure the organization's performance in meeting goals and objectives for quality, efficiency, and timeliness. Performance measures track the productivity of work crews, efficiency of maintenance work, and accomplishment of maintenance plans. Performance reporting provides accountability to top management, the Mayor and City Council, and aids budget and operational decision-making.

Moreover, monitoring performance trends over time provides early warning of maintenance backlogs, declining asset conditions, and the need for corrective actions.

* * * * * *

The next several sections of this chapter assess how effectively the Public Works Department meets these best practices.

2. THE PUBLIC WORKS DEPARTMENT SHOULD DEVELOP A CLEARLY WRITTEN FIVE-YEAR STRATEGIC PLAN.

Public sector managers are often so preoccupied with immediate issues that they lose sight of their ultimate goals. That's why a strategic plan is a necessity. It may not guarantee success, but without it the Public Works Department is less likely to achieve its goals. A sound plan should:

- Serve as a framework for decisions or for securing support / approval;
- Explain the goals and objectives of the Department to others in order to inform, motivate and involve;
- Assist benchmarking and performance measurement; and
- Stimulate change and become the building block for the next plan.

The best practices regarding development of a strategic plan that should be utilized by the Public Works Department are presented in the table below:

The department has a multi-year strategic plan with annual goals and measurable objectives based on identified needs, projected workload, and expenditures and revenues.
The department maintains and publishes a clearly written, multi-year (five years at a minimum) strategic plan to provide vision and direction for the department. The plan links citywide and department goals.

In developing the strategic plan, the department: • Identifies and formally adopts a limited number (5 to 10) of departmental priorities to guide the department's strategies and major financial and program decisions; • Considers the impacts of the city's financial condition, current expenditures by the department, and opportunities to reallocate staff and other resources to enhance performance; and • Instructs departmental management on how these priorities should be considered in making program and budget decisions.
The strategic plan clearly delineates the department goals, and objectives and strategies for achieving them. In developing these strategies, the department considers alternative service delivery systems such as outsourcing.
The plan also delineates the priorities the City Council and Mayor assign to its goals, objectives, and strategies.
The objectives in the strategic plan are measurable, and the department has set annual objectives for each goal for at least five years into the future.
The department's goals, objectives, and performance measures are based on past performance, identified needs, projected workload, and expenditures and revenues.
The plan delineates the managers responsible for implementing the strategies in the plan and the time frames for implementation.
The department head annually assesses the progress the department has made toward achieving the goals and objectives in the plan.

In developing the strategic plan for the Department, the Department should (1) identify its strengths, weaknesses, threats (e.g., slowdown in growth of City revenues), and opportunities (e.g., increased use of technology); (2) develop a vision and mission statement for the Department; (3) define the goals, objectives and strategies the Department will utilize to achieve those goals, objectives and strategies; and (4) define the managerial responsibilities for accomplishing those goals, objectives and strategies.

Recommendation: The Public Works Department should develop a clearly written, five-year Strategic Plan.

3. EACH DIVISION WITHIN THE PUBLIC WORKS DEPARTMENT SHOULD DEVELOP GOALS, OBJECTIVES, AND PERFORMANCE MEASURES.

Each division head should be held accountable for developing goals, objectives, and performance measures and presenting them to the Director each year as part of their budget proposal at the program level.

Goals should be developed for each division, with objectives developed for each cost center or activity such as traffic signal maintenance and repair, signal construction, street striping and legend painting, sign maintenance and repair, and the like. Performance measures should then be developed to assess the workload, efficiency, and effectiveness with which these objectives are accomplished.

The development of goals, objectives and performance measures at the program level by the Department should consider the guidelines presented below.

- **Goals could be developed for each division and each program within a division**. These goals could give specific direction on how the divisions, and the programs within these divisions, will contribute to the mission and goals of the Department. These goals could not be quantified. These goals could span multiple years.

- **Objectives could be developed for each program**. Objectives are outcome-based statements of specifically what will be achieved within the fiscal year. Each program could have 3 to 5 objectives. The objectives could clearly demonstrate progress toward the goal of the program. These objectives could be written to allow measurement of progress, and be quantifiable.

- **Performance measures could be developed for each objective**. Performance measures could convey the extent to which an objective has been met. These measures could include a range of indicators including input, output, efficiency, service quality and outcome. For example, an input measure would be the value of the resources used to produce output, such as the dollars spent on contract seal coating of streets or the staff hours used to patch potholes in streets. An output measure is the quantity or number of units produced such as the linear feet of sewer mains that were cleaned. An efficiency measure is the inputs used per unit of output such as the cost per water distribution valve exercised. A service quality measure is the degree to which customers are satisfied with a

program or how accurately or timely a service is provided such as the frequency that all of the water distribution valves are exercised. An outcome measure is the qualitative consequences associated with a program or service – the ultimate benefit to a customer. An example would be the amount of claims paid by the City for tripping over sidewalks.

- **The Department could develop reliable and accurate data to measure performance**. Each performance measure needs a consistent reliable data source. The Department could acquire and install the information systems necessary to develop good data sources. This would include a range of data sources such as citizen satisfaction indicators, facility condition ratings, etc. Departmental management and staff could work closely together to define the method, frequency, and reliability of data collection.

- **The Department could communicate and use performance measurement data for decision-making and accountability reporting**. Top management of the Department could communicate their commitment to the value and use of goals, objectives, and performance measures to all Departmental managers and supervisors. Management could involve line managers and staff in the development and reporting of goals, objectives, and performance measures. The Departmental managers could communicate the results of these goals, objectives, and performance measures internally to its staff.

Each division head should report quarterly to the Director on their progress in achieving their goals and objectives, using the performance measures as a measure of progress.

In developing these goals, objectives, and performance measures, the departmental management team should consider the best practices for development of goals, objectives and performance measures presented in the exhibit on the following page.

Recommendation: The Department should develop goals, objectives, and performance measures.

4. THE DEPARTMENT SHOULD DEVELOP AN INFORMATION TECHNOLOGY STRATEGIC PLAN.

The near explosive expansion of technology, the advent of PDA technology and applications, and increasing demands for technology in the field to support field operations – all part of the information revolution – intensify the need to look at a full array of information technologies (data, voice, image) and the needs of the Public Works Department over the next several years.

These are all reasons for the Public Works Department to develop an information technology strategic plan: to focus scarce resources where they will have the greatest and most beneficial impact. The information technology strategic plan should have a three-year horizon, but should be updated every fiscal year.

The purpose of the strategic plan is presented below.

- The purpose of the Information Technology Strategic Plan should be provide a strategic direction for information systems and guide the use of information technology to support the achievement of the Department's business goals. The Information Technology Strategic Plan will provide a roadmap for implementation of future information technology. It also will serve as management's principal working document for the next three years as DPW continues to upgrade and enhance its information systems.

- The objectives of this effort should be to:

  – Articulate the Department's business vision, mission and key goals to provide a framework for information technology strategic planning.

  – Conduct a high-level assessment of Department's current information technology environment including:

    •• Organization
    •• Applications
    •• Data
    •• Infrastructure
    •• Projects.

- Develop recommendations for improved technology that will support the achievement of the Department's business goals

- Prepare a three-year information technology strategic plan that reflects a vision for future use of technology and provides a framework for operational and tactical decisions.

The Public Works Department should develop its own information technology strategic plan.

The Department should utilize the following approach in developing their information strategic plan:

- **Briefly describe the major business challenges and how the Department plans to use information technology to contribute to overcoming these challenges**. Include the contributions the Department's initiatives will make to information technology goals as described in the citywide information technology strategic plan. Describe the planning process used and the parties included.

- **Describe the mission of the Department**. This is a statement of why the Department exists and its fundamental purpose. Also, briefly describe the primary program or service areas of the Department.

- **Describe the primary business objectives for the next three years (or for that time frame for which they are formally established).** A three-year business-planning horizon starts with the first day of the next fiscal year. This serves as the point of reference for information technology strategies and tactics required in the Department plans.

- **Describe the Department's information technology strategies to support the business functions of the Department**. An information technology strategy is a statement of direction, approach, and / or method as to how the Department will apply information technology to achieve its business functions. Department information technology strategies should conform to the citywide information technology strategic plan currently being developed or should be justified and approved by the Information Systems Department before implementation.

- **Describe the Department's level of compliance and / or plans to comply with the approved Information Systems Department standards**. If the Department is not currently in compliance with these standards, it should list the activities, time frames, and major issues associated with achieving compliance.

- **Describe all Department information technology projects that will have an estimated development and implementation cost (not operations) of $25,000 or more and that will be submitted to the City Council for approval to begin in or continue into the next three fiscal year(s).** A project is defined as an expenditure of resources to build and implement an information technology based product or service or the capability to provide a information technology based product or service. Examples of such activities involve software applications, information technology equipment, information technology training and planning. Include all information technology projects meeting this threshold regardless of source of funds or funding category. For each project, include the following:

  – Project title.

  – Project description. Is this a new project or an upgrade to an existing project?

  – Project start and end dates (nearest quarter).

  – Project focus. What strategies, goals and business needs of the Department and the City does the project support? What opportunities have been identified for sharing of hardware and software resources?

  – Cost-benefit analysis:

    •• What are the measurable improvements in effectiveness and productivity (i.e., service level increase, service outcome and cost reduction) that will result from the technology?
    •• What is the measurable reduction in organizational overhead that can be achieved or the amount of overhead resources that can be transferred to direct customer service?
    •• How will current equipment and technology investments be maximized?
    •• What is the detailed project costs, including personnel, integration and annual support?
    •• What re-engineered work processes have been considered?

  – Project Management:

    •• Identify the system development, maintenance, operation and project management practices that will be used to successfully support the investment over the life of the application?
    •• Identify who has been given the responsibility and authority to manage the project and what are the project outcome measurements?

– Data Management:

  - Does the project focus on providing front-line, service delivery staff with the tools to access all needed information? If so, how?
  - Will information captured or generated by the application, regardless of its location within the City, be universally available (subject to the need and right to know)?
  - Will information be delivered for direct client services, for management analysis and for business decisions? If so, how?
  - What opportunities have been identified for information to be shared by other departments to minimize the cost of collection and maintenance and to maximize accuracy?

– Project Technology:

  - How does the technology support the integration of different products acquired at different times for different purposes?
  - Will the project employ technology that includes proven off-the-shelf systems, or does the project include production pilots and other small-scale trials in order to reduce project risks or to evaluate the creative use of technology?
  - Are the communication systems compatible with the City's communication infrastructure? If so, how?
  - In what ways will the technology improve public access to City government by citizens?

– Project Funding:

  - What is the source of funding?
  - If this project is funded outside the general fund, what are the restrictions?
  - Who will pay for on-going project maintenance and support?

The Department should provide a summary of information technology expenditures requests. The budget and the Department's information technology plans should include the following costs:

- Current and on-going hardware acquisition and maintenance;
- Infrastructure acquisition and maintenance;
- Software acquisition and maintenance; and

- Staff training.

Recommendation: The Department should develop an Information Technology Strategic Plan with at least a three-year horizon.

Recommendation: The Department should update the Information Technology Strategic Plan annually.

5. THE PUBLIC WORKS DEPARTMENT SHOULD INSTALL AN ASSET MANAGEMENT SYSTEM INCLUDING ACQUISITION OF A COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM.

The Public Works Department has not developed a comprehensive maintenance plan. The Public Works Department should install a maintenance management system. The City's should use a maintenance management system to enable managers to answer such questions as the following:

- **Are Public Works Department preventive maintenance procedures working?** The management of the Department should be able to look at total employee hours, grouped by work type or class comparing the amount of Emergency/Breakdown repairs to the amount of preventive maintenance work accomplished. This should enable management to assess the extent of a decline in Emergency/Breakdown repairs if preventive maintenance tasks are performed at the correct frequency. The Public Works Department cannot answer this question at present.

- **Are Public Works Department preventive maintenance inspection frequencies adequate?** The management of the Department should be able to look at the number of scheduled work orders grouped by work type or asset comparing the amount of work that was identified as a result of performing preventive maintenance (such as televised inspections of sewer mains or leak detection inspections of water mains) to preventive maintenance standards and guidelines promulgated by such organizations as the American Water Works Association. The Public Works Department cannot answer this question at present.

- **Where are my problems in reliability and where should my maintenance department focus their limited resources?** The management of the department should be able to look at the total cost for work type or class, such as Emergency/Breakdown and Call-In, sort the work requests by asset, and sort by location. This will identify by asset where all the costs are being accumulated. This is typically referred to as the "Top 10" list or "Bad Actors" report. This is

essential in identifying where water or wastewater mains should be replaced, streets resurfaced, etc. The Public Works Department cannot answer this question at present.

- **Where is maintenance spending their energy?** The management of the department should be able to look at the total employee hours grouped by work type or class. Depending on the established work types, this will identify the type of work that the maintenance organization is accomplishing. This is critical to ensure true maintenance work is being accomplished in support of production goals and targets. The Public Works Department cannot answer this question at present.

- **What is our backlog of work?** The management of the department should be able to look at the backlog of work, assuring that there is no less than 2 weeks and no more than 4 weeks of backlog (all parts/materials available waiting scheduling). The Public Works Department cannot answer this question at present.

- **How efficient is our maintenance workforce?** The management of the department should be able to review the labor hours per work order and compare these to benchmarks that exist for the different work activities such as pothole patching, street sweeping, distribution valve exercising, etc. The Public Works Department cannot answer this question at present.

- **How much money is our department spending on maintenance and repair for the various types of work activities?** This includes parts, material and supply costs, contractor costs, and maintenance labor costs. The management of the department should be able to look at the material cost, contractor cost, and labor cost grouped by work type. The Public Works Department cannot answer this question at present.

A system should be utilized to serve as the basis of a comprehensive maintenance plan that identifies the services provided, the levels of service, the outputs of each of these services, and the costs of those services, both total and per unit of output. This is not an idealized perspective of what the Public Works Department should be doing, but a basic perspective of what is necessary to manage the maintenance and repair of the City's infrastructure.

There are a number of elements to the successful installation of a comprehensive maintenance plan by the Public Works Department. These elements include the following:

- **Asset Management.** An asset inventory must continue to be developed. This data is the constant of a successful comprehensive maintenance plan. Even if the latest technology tools have been implemented, a system without data is not very useful. Keeping asset information – features and location – up-to-date, accessible and understandable is the challenge of a successful comprehensive maintenance plan.

- **Work Management.** Work management includes all the activities involved in maintaining assets at a pre-defined condition level. The value of a successful comprehensive maintenance plan is its ability to recommend maintenance actions, such as which assets should be inspected or evaluated; and of those, which should have maintenance activities scheduled. Effective work management predicts and tracks the costs of labor, equipment and materials needed for maintenance and budget planning, and monitors the performance of actions taken.

- **Service Request Management.** As a starting point for many of the activities and work orders within a Public Works Department, service request management provides access to information such as citizen requests, work order generation and caller history. The ability to track the request(s) for work on an asset(s) provides a Public Works Department with the ability to keep better track of their data and in turn provide a better level of service to their citizens.

- **GIS Integration.** The term Geographic Information System (GIS) has often been used as the broad term to describe asset management. In reality, a GIS is only ***one piece*** of the process – without up-to-date supporting asset data it has limited use. However, linking a database and a GIS makes another level of management available by providing more options to analyze asset information.

  - **Visual information.** A GIS can display asset symbols on a map with links to their corresponding database records. The GIS provides the ability to analyze data based on geographic information, allowing patterns to emerge on a map that may not be as obvious in rows and columns of data.

  - **Communication.** Asset information can be shared in a visual format that is often better understood by others including the Mayor, City Council and the public.

– **Asset location** Finding the location of an asset is faster and easier with the help of a map.

The Public Works Department should install a maintenance management system. However, there are a number of steps that need to be accomplished before the management system can be effectively utilized in the development of this comprehensive maintenance plan. These steps are presented below.

(1) A Complete Inventory of Work Activities Performed by Facility Maintenance, Highway Maintenance, Wastewater Collection System Maintenance, and Water Distribution System Maintenance Needs to Be Developed.

The Public Works Department needs to assure that all of the primary work activities (i.e., street sweeping, repairing water main leaks, pothole patching, crack sealing, drainage inlet cleaning, pavement legend painting, etc.) that consume the majority of staff work hours are defined. This would include all forms of leave. All 2,080 staff hours for each employee should be included within the system.

(2) Performance Standards Need to Be Developed.

Performance standards are formally established criteria for determining the need for work, required quality of work, the resources necessary to achieve quality and expected rate of productivity, etc. Maintenance standards are developed for each maintenance activity.

Each performance standard should include, at a minimum, six components:

- A brief description of the specific work involved;
- The frequency with which the work should be performed (or the level of service);
- The crew size required for the job;
- The equipment, material, and tools needed;

- The performance expectations for each job or average daily productivity; and
- The recommended procedures for completing the job.

A sample performance standard for traffic signal cabinet maintenance is presented in the exhibit following this page.

(3) An Annual Work Plan Needs to Be Developed.

An annual work plan needs to be developed within the Hansen maintenance management system that will not only guide managers and first-line supervisors in prioritizing and performing specific tasks, but will provide a document to hold managers and first-line supervisors accountable for results. The annual work plan estimates the kind and amount of work to be done in the next fiscal year. The managers and first-line supervisors should prepare the annual work plans as part of the budgetary preparation process. The development of an annual work program takes into consideration two major questions:

- What amount of work is needed to provide the desired levels of service to the public?
- What required levels of staff, equipment, and materials will be needed to provide that level of service and at what cost?

Exhibit 11

Sample Performance Standard

ACTIVITY NO:	ACTIVITY NAME:	DATE:
	Pavement Messages	Jan 07

ACTIVITY DESCRIPTION:
Painting of traffic messages on city owned streets and parking lots as required by routine maintenance, overlays, preventive seals and Traffic Engineering requests. All painting shall conform to the manual on Uniform Traffic Control Devices.

PERFORMANCE CRITERIA:
PRIORITY SERVICE
Painting of overlays and preventive seals should be performed in a timely manner
Some special projects may require immediate service
SCHEDULED MAINTENANCE
All other painting should be performed as it can be scheduled
Repaint all existing pavement messages at least once a year

TYPICAL CREW SIZE: 2 Person

WORK METHOD:
Load striper with paint or load preformed thermal plastic messages.
Load striper and additional paint on flat bed truck
Locate truck in a safe position at job site and set up traffic control
Clean area if necessary and paint message or preheat asphalt prior to applying thermal plastic message.
Ensure traffic does not cross wet paint
Store tools and materials securely on truck and proceed to next job site

EQUIPMENT:

1, 2-ton flat bed	1 Walk behind striper w/removable gun	Traffic Cones
Stencils	Hand Tools	Propane torch

MATERIAL:

Beaded traffic paint	Paint rollers	Preformed thermoplastic

PRODUCTION STANDARDS:

UNIT OF MEASUREMENT:	message
AVERAGE DAILY PRODUCTION:	37
MAN HOURS PER WORK UNIT:	27

NOTES: Working in heavy traffic may require a three-man crew to perform the painting of pavement messages in a safe fashion.

The annual work program serves as a planning document that establishes objectives for the coming fiscal year in terms of the specific work activities to be performed, the service levels to be provided, and the allocation of staff in the provision of these services. It provides a clear indication of the relationship between funding and service levels. It also serves as a valuable tool to model trade-offs between different funding levels and the level of service that can be provided.

The process for development of this annual work plan, outlined in the exhibit following this page, will fundamentally change the focus of managers and first-line supervisors from their current roles of field supervision to that of management of resources in order to ensure conformance with the annual work programs.

The second exhibit following this page presents a sample annual work program for street maintenance.

(4) A Monthly Performance Report Should Be Generated Comparing Planned Versus Actual Performance and Costs.

A sample monthly report is presented in the third exhibit following this page. The monthly report should be generated by the automated work order system. It should be designed to enable:

- A comparison of planned versus actual staff hours per work activity for the previous month and year-to-date for each work activity;
- A comparison of actual versus planned work output (miles of curbs swept by street sweepers) per month and year-to-date for each work activity;
- A unit cost analysis that compares the planned versus actual unit costs for each work activity per month and year-to-date; and
- A comparison of actual productivity (work output per staff hour) versus the expected productivity as stated in the performance standards.

Exhibit 12 (1)

Management Requirements for the Development of an Annual Work Plan

Component in the Development of the Annual Plan	Requirement	Responsibility
Identification of Information Sources and Needs	• The Divisions should analyze the sources of information available in its determination of feasible service level targets. These include the daily work orders generated by each crew. • 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.	• Although this step should be initiated by the managers and supervisors for each unit, it should involve, initially, the first-line supervisors as well.
Analysis of Historical Trends in Services Provided	• The Divisions 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. • 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 by work task such as pothole patching, signal cabinet preventive maintenance, etc. • This analysis will require a thorough review of the Division's data within Hansen in order to extract person-hour data by activity.	• Although the analysis may be delegated to first-line supervisors, the effort should be initiated by the managers of each unit. • The Public Works Director should be consulted in the process to ensure that proposed service levels are appropriate.

Exhibit 12 (2)

Component in the Development of the Annual Plan	Requirement	Responsibility
Service Level Needs Analysis	• After the development and presentation of the raw data regarding historical trends, this 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, numbers of citizen requests, 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 that are most critical for the Divisions to accomplish. This definition represents the foundation for future analyses that 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.	• Division Heads • First-line supervisors • The Public Works Director should provide input into the process to ensure that priorities for work accomplishment are in accordance with Departmental expectations.
Identification of Personnel and Equipment Resources Needed to Accomplish Targeted Service Levels	• This step will be the natural result of the preceding step. The Divisions 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.	• Division Heads • First-line supervisors • The Public Works Director should provide input into the process to ensure that priorities for work accomplishment are in accordance with Departmental expectations.

Exhibit 12 (3)

Component in the Development of the Annual Plan	Requirement	Responsibility
Development of Program Budgets	• This step represents the relatively mechanical process of developing program 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 Division budget, therefore, is the result of an analysis of the work activities and service levels, as opposed to the projected escalation of expenses for the Division as a whole, based on the previous years' expenditures.	• Division Heads • First-line supervisors • The Public Works Director should be responsible for guiding the process, and for assembling and presenting the final budget package to the Mayor. The Public Works Director will also be responsible for making decisions regarding budgetary reductions, additions or reallocations between Divisions prior to the development of the final package.
Activity Monitoring and Reporting	• Once targeted service levels have been defined and budgets established for each activity, each Division Head and first-line 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 Division's ability to meet performance targets. • Corrective actions must be defined.	• Division Heads should be responsible for monitoring of budgets and work accomplishment according to plan, for each of their assigned areas. • Monthly meetings with the Public Works Director should be planned. These meetings should focus on variances from plans, and the corrective actions necessary.
Management of Resources	• 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 that may legitimately cause deviations from original plans may include weather related problems, unforeseen employee absences or turnover, or cost/labor issues with contractors.	• Division Heads should monitor these issues daily and make refinements.

Exhibit 13

Sample Annual Work Program for Street Maintenance

Work Activity	Quantity	Inventory Unit	Effort Level	Work Quantity	Work Unit	ADP	Crew Days	Crew Size	Labor Days	Labor $	Equip. $	Mat'l $	Total $
Program 01 – Street Maintenance Administration													
Vacation	2,200	Labor Hour	1.0	2,200.0	Labor Hour	24.0	91.7	3.0	275.0	$68,750	$0	$0	$68,750
Other Time Off	800	Labor Hour	1.0	800.0	Labor Hour	32.0	25.0	4.0	100.0	$25,000	$0	$0	$25,000
Sick	800	Labor Hour	1.0	800.0	Labor Hour	28.5	28.1	3.6	101.1	$25,263	$0	$0	$25,263
Meetings/Training	850	Labor Hour	1.0	850.0	Labor Hour	30.0	28.3	3.7	104.8	$26,208	$1,784	$0	$27,992
Program Totals									***580.9***	***$145,221***	***$1,784***	***$0***	***$147,005***
Program 02- Pavement Maintenance and Repair													
Pothole Patching	420	Lane Mile	0.6	252.0	Tons	2.8	90.0	2.0	180.0	$45,000	$19,008	$19,548	$83,556
Remove/Replace Base	420	Lane Mile	6.0	2,520.0	Sq. Yds	62.5	40.3	3.0	121.0	$30,240	$13,862	$10,777	$54,879
Skin Patching	420	Lane Mile	55.0	23,100.0	Sq. Yds	218.0	106.0	3.0	317.9	$79,472	$59,315	$52,830	$191,617
Program Totals									***636.8***	***$159,212***	***$95,771***	***$84,930***	***$339,913***

Exhibit 14

Sample Performance Report for Street Maintenance

Year-to-Date Work Progress Report for Street Maintenance
Period: July 1, 2006 – July 30, 2006

Work Activity	Labor Days		Amount of Work		Total Cost		Productivity	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Program: 08 – Pavement Maintenance								
Pothole Patching	15	18	42 tons	40 tons	$6,963	$7,862	2.8 tons per crew day	2.4 tons per day
Remove/ Replace Base	10	26	210 Sq. Yds.	456 Sq. Yds.	$4,573	$9,602	62-1/2 sq. yds. per crew day	68-1/2 sq. yds. per crew day

(5) Acquire a Computerized Maintenance Management System.

To assist in the installation of the asset management system, the Public Works Department should acquire a computerized maintenance management system. This system is essential to enable work planning and scheduling, inventory management, service request management, daily work reporting, etc.

The estimated annual cost impact associated with this recommendation is presented in the table below.

Annual Cost Increase		One-Time Cost Increase	
Annual software maintenance and support	$10,300	Purchase cost for a CMMS Training	$55,000 $5,000

Recommendation: The Public Works Department should develop and install a maintenance management system.

Recommendation: The Public Works Department should acquire a computerized maintenance management system.

6. POLICIES AND PROCEDURES FOR THE DEPARTMENT SHOULD BE CLEARLY DOCUMENTED.

The Public Works Department should develop a policies and procedures manual to guide its managers and first-line supervisors and assure uniformity in the critical processes of the Department.

In developing policies and procedures for the Department, the following approach should be utilized.

- **Minimize.** The policies and procedures should be kept to a minimum.
- **Best Methods.** Make certain the procedure represents the “best method”. This means the procedure has undergone detailed analysis and is continually challenged.
- **Review and Revise.** All policies and procedures should be reviewed annually.

- **Keep Current.** The problem with many policies and procedures is that they have long ago outlived their usefulness. No one remembers why the policies and procedures were created in the first place. Sometimes they contradict each other and create even more confusion. Responsibility for updating these policies and procedures should be clear.

- **Short is better than long.** It is not the quantity, but the quality of information that is the essential problem of the information age.

- **Be ready to change.** The key to organizational effectiveness and efficiency is finding a better way. The Department must always be ready to challenge current policy – throw it out – change it.

- The policies should be available on the Department's intranet site. This should facilitate easy updating.

The Department should strive to achieve the best practices presented below in developing the policies and procedures manual.

The department has developed written policies and procedures to guide managers and supervisors.
The department has established a committee to develop, update, and evaluate its policies.
The committee annually recommends changes to the department's policies and procedures that are needed to reflect changes in law, city or department action.
The committee periodically (once every four or five years) evaluates and recommends changes to the department's policies to ensure that they are complete and relevant.
The Public Works Department Director reviews, changes (if necessary), and adopts the committee's recommended changes to district policies.
The department has developed procedures dealing with department-wide administrative matters.
The Public Works Department Director has a process to annually update the procedures to reflect changes in laws or City Council actions that affect administrative matters.
The Public Works Department Director has a process to periodically (every four to five years) evaluate and revise the procedures to ensure that they are complete, relevant, and provide for the efficient operation of the department.
The Department's policies and procedures are readily accessible to all departmental staff, and staff uses them to guide their activities.
The City Attorney reviews all proposed policies and procedures revisions to ensure that they comply with state requirements and are relevant and complete.

Recommendation: The Public Works Department should clearly document its policies and procedures.

Recommendation: The Public Works Department should establish a policy and procedure committee consisting of three to five staff that includes a representation of managers from all divisions.

Recommendation: The completed policies and procedures manual should be posted on the City's intranet and website.

7. THE DEPARTMENT SHOULD DEVELOP A TRAINING PLAN FOR ITS EMPLOYEES INCLUDING A NEEDS ASSESSMENT.

Development and execution of a well-conceived training plan is the cornerstone upon which a successful training program rests. A training plan exists on at least two levels:

- **Department-wide** – encompassing the entire department and covering a relatively elastic time period of several years (this is a reflection of a strategic plan or overall set of goals).
- **Division-specific** – describing divisions within the department and covering a discrete fiscal or calendar time frame (this is a reflection of concrete, measurable goals and objectives).

In developing a training plan, the department is linking the skill development of its employees to its own strategic plan and an assessment of its strengths and weaknesses. The department should strive to achieve the best practices presented below and on the following page in developing this training plan.

The department provides a comprehensive staff development program to achieve and maintain high levels of productivity and employee performance.
The department: • Conducts orientation programs for all new employees, and includes information on departmental procedures, performance expectations and evaluations, training and career opportunities, and personnel policies regarding such issues as absences, leave approval and tardiness; and • Has a department-wide training program and maintains training records on each staff member.
The department has solicited and used input from supervisors and employees hired within the last three years to establish, revise, or affirm its new employee orientation programs, including content and approach.
The department has mentoring programs, as appropriate, for new employees.

The department plans training programs based on department-wide needs assessment that includes input from employees and their supervisors at least every other year.
The department establishes and implements formal staff development plans to provide on-going training for employees. The responsibility for training classes for employees may be delegated to a division within the department (i.e., Fleet Management employees may be trained by Fleet Management), but that unit provides the Departmental Advisor with copies of annual plans, training schedules, and attendance rosters.
The department has procedures to evaluate individual in-service training activities, including employee feedback, and to evaluate the extent to which annual training efforts have met identified long-term training objectives.
The department provides a comprehensive staff development program for managers and supervisors.
All managers and supervisors have completed (or anticipate completing within the current fiscal year) management and supervisory training programs.
The department has a process for identifying employees with the potential for employment in managerial and/or supervisory positions, and for providing training to them prior to appointment to a managerial and/or supervisory position.
The training program for new managers includes a mentoring component.

Recommendation: The Department should develop a training plan for its employees based upon a needs assessment.

8. DEVELOP AN EQUIPMENT OPERATOR TRAINING PROGRAM.

The Public Works Department lacks a formal equipment operator training program to provide training in the operation of heavy equipment such as backhoes, skip loaders, rollers, three-axle dump trucks, etc.

The Department should develop such a program to establish a standardized process by which equipment operators may advance through the progressive job classifications and so that the Department can be sure that its employees have been certified to operate heavy equipment before their actual use. Employees should be required to successfully complete operator safety instruction, and operator effectiveness instruction consisting of classroom instruction and on-the-job equipment instruction. Training, for example, for operation of a backhoe could include earthmoving fundamentals such as the proper use of a variety of attachments to dig trenches, break rock and/or concrete, back-fill excavations, and scoop and/or dump materials, personal, work site and machine safety, pre-operation inspection and hands-on operation, and

machinery maintenance. Training in the proper operation of a backhoe, for example, should not just focus on how to manipulate the controls and choose the right digging attachments. Operators should also learn applicable safety measures such as safe moving and operating procedures, safe excavating procedures and loading procedures.

Recommendation: The Public Works Department should develop an equipment operator training program for the proper and safe use of heavy equipment.

9. A FORMAL SAFETY MANAGEMENT PROGRAM SHOULD BE ESTABLISHED AND IMPLEMENTED.

The City's Personnel Department has developed citywide safety policies.

However, the Public Works Department does not have a comprehensive employee safety program. There are a number of elements, essential to effective employee safety program that are absent.

- The Department has not established goals, objectives, and performance measures for its employee safety program. These could include such objectives as the total number of recordable injury and illness cases per 100 full-time employees shall be less than the average for local governments in Massachusetts.
- Ongoing inspections are not conducted of City facilities or work sites to identify hazardous working conditions and work practices.
- The City does not provide a "core" safety training program for employees.
- The Public Works Department does not have a designated Safety Coordinator.
- Neither the City nor the Department have active safety committees. Both should exist.
- An employee safety handbook has not been developed.
- The Personnel Department has not developed any tailgate safety training modules for delivery by first-line supervisors.

There are clearly a number of opportunities by the Public Works Department to

improve its employee safety program.

Recommendation: The Personnel Department should work with the Public Works Department to enhance the Department's employee safety program.

Recommendation; The Public Works Department should establish goals, objectives, and performance measures for its employee safety program.

Recommendation: The Personnel Department should conduct inspections of Public Works Department facilities not less than once a year, and conduct random inspections of work sites in the field not less than four times a year.

Recommendation: The Personnel Director should develop and deliver a "core" safety training course for all City employees. All City employees should be required to attend this training.

Recommendation: The Public Works Department should designate an employee as the Safety Coordinator for the Department with this responsibility to be a related duty.

Recommendation: The Personnel Department should establish a citywide safety committee. The Public Works Department should establish a Department-wide safety committee.

Recommendation: The Personnel Department should develop a citywide employee safety handbook.

Recommendation: The Personnel Department should develop standard tailgate safety training modules for delivery by first-line supervisors. First-line supervisors should be required to deliver these tailgate safety modules not less than once a month and report the names of the employees that attended.

7. ANALYSIS OF ENGINEERING

7. ANALYSIS OF ENGINEERING

This chapter presents an analysis of the Engineering Division of the Public Works Department. This Division is managed by the City Engineer and consists of ten (10) authorized positions. These positions include two (2) Assistant City Engineers, one (1) Civil Engineer, one (1) Junior Civil Engineer, a Senior Engineering Aide, and a Principal Clerk position. This staff performs numerous tasks including the following:

- Oversight of capital improvement design and construction related to water, sewer, streets and bridge capital projects.
- Maintenance and upkeep of City's Pavement Management System.
- Inspection of capital improvement construction projects.
- Assists public in answering platting or mapping related questions.
- Member of Technical Advisory Group which reviews zoning changes, subdivisions, and planning developments.
- Issuance of various permits including street cuts, sewer permits and development reviews.

1. THE ENGINEERING DIVISION SHOULD CONTINUE THE DEVELOPMENT OF THE ASSET MANAGEMENT PLAN.

The Public Works Department has recently completed Phase I of an asset management plan. This plan will provide greater insight as how to best manage the replacement of the City's aging water and wastewater infrastructure. It is estimated that the total replacement cost of the City's water and wastewater assets is approximately $314 million. Gloucester retained Brown and Caldwell to develop a replacement planning model which will identify assets within the water and sewer infrastructure and

their expected replacement date and cost. The replacement planning model will play an important role in the planning and replacement of the City's assets.

According to the study, the City will have to make significant investments in its infrastructure to sustain it over the next 30 years. The overall estimate for the 30-year period is approximately $171 million or approximately $5.7 million per year. This is an average cost per resident of $185 / year.

The Public Works Department should develop a plan to address the recommendations contained within the replacement planning model including a schedule, source of funding, and managerial accountability. This should be a collective effort of the Public Works Director, City Engineer and the Finance Director.

Recommendation: The Engineering Division should proceed with implementation of the replacement planning model.

Recommendation: The Public Works Director, City Engineer, and Finance Director should develop a plan for implementation of the replacement planning model.

2. THE ENGINEERING DIVISION SHOULD UTILIZE THE PAVEMENT CONDITION EVALUATION METHODOLOGY DEVELOPED BY THE AMERICAN PUBLIC WORKS ASSOCIATION.

The City's road system is broken down into functional segments and then rated as to the condition of the roadway. Currently, the City of Gloucester has a pavement condition index (PCI) of 74.2 (with 100 being the highest possible index). Overall, a pavement condition index with a range above 70 indicates the roadway is in good condition, while those with a condition index with a range from 25 to 49 are poor condition and below 25 in very poor condition. The table below presents a summary of the City's road network and its condition by pavement condition index ranges.

Pavement Condition Index Range	Repair Method	Length	%
1-40	Reconstruction	7.61	9.3%
41-65	Grind & Overlay	18.77	23.1%
66-75	Microseal	17.63	21.7%
76-85	Crack Seal	6.48	8.0%
86-100	Defer	30.93	38.0%

Gloucester's pavement condition index is 74.2 out of 100. This would indicate that the City's road system is in good condition.

Yet 32% of the centerline miles of roadway require grind and overlay or reconstruction. The pavement condition index seems to overstate the actual condition of the City's streets.

It is recommended that the City utilize the pavement condition evaluation methodology developed by the American Public Works Association MicroPAVER. MicroPAVER's Pavement Condition Index (PCI) methodology recently received the American Society for Testing and Materials (ASTM standard D6433-99). MicroPAVER is the only pavement management system to have received an ASTM standard designation. Standard D6433-99 is the only pavement rating methodology recognized for rating streets pavements.

Recommendation: The Engineering Division should review its current pavement condition rating system to ensure the legitimacy of the rating system, that will allow the City to make properly informed decisions.

Recommendation: The Engineering Division should adopt the pavement condition evaluation methodology developed by the American Public Works Association.

3. THE ENGINEERING DIVISION SHOULD EVALUATE THE CONDITION OF ITS ROADS WITH ITS FULL-TIME ENGINEERING AND HIGHWAY MAINTENANCE STAFF, NOT COLLEGE INTERNS.

The Public Works Department currently reviews the condition rating of its pavement condition once every three years. This is an appropriate interval for this evaluation.

In the past, an outside consultant completed this assessment. However, this year, a college intern will complete the assessment.

The Department should use an outside consulting firm to train its full-time staff to conduct the assessment. The Department should utilize a mix of its full-time engineering staff and highway maintenance staff to conduct these assessments once the training has been provided. The Department should not use a college intern.

Recommendation: The Engineering Division should utilize its full-time Engineering and Highway Maintenance staff to conduct the pavement condition assessment.

4 THE ENGINEERING DIVISION SHOULD DEVELOP STRATEGIES FOR FUNDING REQUIREMENTS RELATED TO PREVENTIVE AND CORRECTIVE MAINTENANCE OF THE CITY'S STREET SYSTEM.

The City of Gloucester currently receives approximately $400,000 in Chapter 90 state highway repair assessments each year. This is the only funding source for the repair and maintenance of the City's streets. As the table below indicates, the City has a backlog of $8.3 million in reconstruction and grind and overlay projects.

Repair Method	Length	Percent	Cost
Reconstruction	7.61	9.3%	$4,080,879
Grind and Overlay	18.77	23.1%	$3,592,393
Microseal	17.63	21.7%	$592,991
Crack Sealing	6.48	8.0%	$26,397
Defer	30.93	38.0%	$0
Grand Total	**81.42**	**100%**	**$8,292,590**

If all items remained constant, it would take the City 20 years to complete the current maintenance agenda.

The City currently rates its roadways as the following.

- Good 34%;
- Average 51%; and
- Failed 15%

It is the current policy of the City to only use Chapter 90 funding for the replacement and maintenance of the City's street infrastructure. Other than Chapter 90 money, the only other way a street is repaired or replaced is through a City water/sewer project.

At this level of funding, the City's pavement condition index will continue to deteriorate. This level of funding is significantly short of what is required to maintain the City's pavement network. At a minimum, the project team recommends that the City increase the level of funding by not less than 50% to $600,000 annually. The City should not rely solely on Chapter 90 funding.

In the longer term, the City should evaluate and develop recommendations that would address the funding requirement for effective preventive and corrective maintenance of the City's street system. Alternatives to be considered should include:

- Allocation of general fund monies focusing first on preventive maintenance of the City's streets and preventing streets from deteriorating to the point where reconstruction is required;
- Using other City-controlled revenue resources for preventive maintenance such as CDBG and redevelopment; and

- The establishment of a special revenue street improvement fund, which is funded primarily by street-cut permits. The City estimates that road opening permits are approximately $175,000 per year.

Recommendation: The Engineering Division should develop funding strategies that would ensure the proper funding levels related to street maintenance.

5. THE ENGINEERING DIVISION SHOULD CHARGE A PAVEMENT RESTORATION FEE FOR UTILITY CUTS.

Public rights-of-way are essential to the economical vitality of the City. The City grants utility and telecommunication companies reasonable access to the public right-of-way to provide services to the community. However, in order for utility and telecommunications companies to maintain or upgrade their services, they need to access the pavement structure via utility cuts and this, in turn, affects pavement performance. These cuts are made to install, inspect or repair buried facilities.

The impact of utility company activity on pavement performance has been a concern of public agencies for many years. Studies undertaken for the cities of Austin, Kansas City, Burlington, Cincinnati, Phoenix, San Francisco, Sacramento, and Los Angeles have concluded that excavations in paved streets degrade and shorten the life of the surface of the streets, and this degradation increases the frequency and cost to the public of necessary resurfacing, maintenance and repair. The studies performed concluded that pavement degradation occurs no matter how well the excavation is restored.

Findings from studies funded by utility companies and public agencies are often contradictory. The results of studies conducted by public agencies show that the presence of utility cuts lower measured pavement condition scores (indexes) compared to pavements of the same age with no utility cuts. The link between the presence of

utility cuts and accelerated pavement deterioration is clear. The process of opening the trench causes sagging or slumping of the trench sides as the lateral support of the soil is removed. The degree of sagging is determined in part by the soil type, moisture content of the soil, and depth of the trench. Quantifying the extent of sagging is very complex, but regardless of the extent, the adjacent pavement is adversely affected.

This zone of weakened pavement adjacent to the utility cut can fail more rapidly than other parts of the pavement. This can be observed in the field by the presence of fatigue (alligator) cracking occurring around the edges of the cut, or spalling around the cut edges. In addition, the introduction of cuts is much like the introduction of cracks on the pavement. If improperly sealed, water intrusion can occur, resulting in loss of fine materials from the underlying base and sub-grade and consequently, loss of pavement strength. This can occur even with the best patching or backfill practices if the edges of the cut are not properly sealed. The more cuts on a pavement, the higher the possibility of water intrusion and subsequent loss of strength. Studies show that trenching operations reduce pavement strength in a zone from 3 to 6 feet on either side of the centerline of the trench. By implication, these zones of weaker pavement require more costly rehabilitation and maintenance activity.

The Engineering Division should take a number of actions to address this problem. This should include charging a pavement restoration fee for utility cuts, and adoption of an ordinance imposing a moratorium on utility cuts on newly renovated streets for three (3) years after filing of a notice of completion or acceptance of a new street or structural overlay of an entire street except as follows:

- Emergency which endangers life or property.

- Repair or modification to prevent interruption of essential utility service.
- Relocation work that is mandated by County, State or Federal legislation.
- Service for buildings where no other reasonable means of providing service exists, as determined by the Director.
- In a City street that the City has scheduled for resurfacing either during the fiscal year (July 1- June 30) when the excavation permit is issued or during the immediately following fiscal year and the work takes place prior to the resurfacing.
- For potholing to verify utility depth or location.
- Trenchless excavations greater than three feet in depth of cover over the utility facility not requiring a significant surface incision greater than industry bore pit standards may be allowed at the discretion of the Director.

North Attleborough, as an example, already charges a restoration fee in addition to the permit fee.

Recommendation: The Engineering Division should develop, for consideration of the City Council, a utility cut ordinance that established a pavement restoration fee.

Recommendation: The Engineering Division should develop and impose a pavement restoration fee upon utilities making and benefiting from excavations in public streets, including the City's water and sewer utility.

Recommendation: Funds that are collected as pavement restoration fees should be expended for the rehabilitation and resurfacing of streets, and deposited in a special revenue fund established for that purpose. The funds deposited in the special revenue fund should include interdepartmental budget transfers for City water and sewer operations utility cuts, and fund transfers at the time of construction contract awards for City water and sewer capital improvement projects.

Recommendation: The Engineering Division should require utility companies to submit five-year plans for major facility installation to coordinate excavations with the City's resurfacing and the recommended slurry seal program.

Recommendation: The Engineering Division should provide an incentive for joint trenching when two or more utility excavators trench by processing a permit as one application saving the utility company costs for permit, plan check, and

inspection fees.

6. THE ENGINEERING DIVISION SHOULD EXPAND THE USE OF NON-STRUCTURAL OVERLAYS FOR PREVENTIVE MAINTENANCE OF STREETS.

Since such a large percentage of pavements are in "Poor" or "Very poor" condition (32% of the City's streets require grind and overlay or reconstruction), it is tempting to invest on the worst streets and only fund overlay or reconstruction projects. However, it is equally important to preserve good pavements. Crack sealing, one of the least expensive treatments, can keep moisture out of pavements and prevent the underlying aggregate base from premature failures. Life-extending surface seals, such as chip seals or micro seals, are also cost-effective for pavements currently in good condition. Therefore, the project team recommends that the City invest in an aggressive preventive maintenance program.

When used properly as preventive maintenance, non-structural overlays prevent future cracking by delaying the aging process of the pavement. They can also correct minor flaws such as rutting, raveling, minor cracks, and reduced pavement friction. Certain products, because of their structure, can only be used on low volume traffic roads and the friction aggregate requirements for these treatments reflect this limitation.

At present, the City relies on micro-sealing as a preventive maintenance technique. Micro-seals are a mixture of polymer modified asphalt emulsion, aggregate, mineral filler, and water, that has a slurry consistency during mixing and application. The micro-seals are continuously mixed and applied with specialized equipment. There are two mix types available based on aggregate gradation: Type II micro-seals and Type III micro-seals. Micro-seal overlays are always applied in two passes. No

compaction is required; however, the emulsion must be allowed to cure before traffic is applied. Micro-seals will accept traffic within 1 hour after application under most conditions. Micro-seals will seal the pavement, reducing oxidation and weathering of the surface. Minor surface distresses such as raveling may also be prevented or corrected. The expected surface life for micro-seals is 5 to 7 years. It can be used for high volume traffic streets.

In expanding the types of non-structural overlays utilized by the City, the Public Works Department should develop strategies to assure the effective use of these alternatives. Important points to note include the following:

- The alternative treatment approaches should consider the different traffic volume, with lower volume streets receiving longer cycles between surface treatments (e.g., chip seal) and pavement overlays;
- The cycle chosen needs to be grounded upon the development of strategies that are tied to the pavement condition index for the street.

The City provided the project team with a listing of Chapter 90 funded projects for the past several years. For example, in 2004, the City was allotted $399,623. This funding was allocated to Eastern Avenue and four other projects. The funding was used to reconstruct these roads, two of which were cold planed and overlayed and two of which were reclaimed and reconstructed. The project team recommends that Chapter 90 funding should be primarily used to fund those sections of roads that require the use of “Micro seal” preventive maintenance strategies. The strategy should be to maintain those roads that are can be maintained with lower cost preventive maintenance and avoid their deterioration to the point that the streets require reconstruction.

Other cities in Massachusetts are utilizing these alternative strategies.

Shrewsbury is using an asphalt rubber surface treatment with aggregate cover and stone seal. Needham uses both stone seal treatments and micro seal treatments. North Attleborough uses micro seal treatments. Barnstable uses an asphalt rubber surface treatment with aggregate cover and stone seal.

It is time for Gloucester to utilize these alternative treatments that are less expensive than pavement overlays and that will preserve the City's pavement.

Recommendation: The Public Works Department should expand the use of non-structural overlays for preventive maintenance of the City's streets.

7. THE ENGINEERING DIVISION SHOULD IMPROVE THE EFFECTIVENESS OF ITS MANAGEMENT OF THE CAPITAL IMPROVEMENT PROGRAM.

The Matrix Consulting Group identified several project management principles that should be applied to each phase of the capital improvement project. These standards include the following eight steps that 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 for each capital improvement project to determine what tasks are to be performed internally and by private contractors, as well as the start, end and milestone dates;
- 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; and

- Management and coordination of the interfaces needed to complete the project.

Underlying all of these principles is management accountability within the Engineering Division to ensure it is accomplished on schedule and within budget.

The review of the practices utilized by the Engineering Division has identified a number of issues associated with how well the Division applies these eight capital project management principles. These issues are presented in the following paragraphs.

- A two-year Gantt chart has not been prepared.

- Staffing requirements for capital improvement projects have not been defined.

- Costs of construction guidelines are not 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 project / time accounting module is not utilized to record the allocation of staff hours for the design, construction inspection, and construction management by the staff of the Engineering Division.

- 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.).

- The capital improvement program status reports generated do not provide important information regarding capital projects, and are not provided on a monthly basis.

- Capital projects are not fully scoped before commencement of design.

- Feedback mechanisms (e.g., final reports) have not been developed for quality assurance purposes.
- Mechanisms are not routinely employed to maintain effective communication with clients.

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.

(1) A Design Authorization Form Should Be Completed Before Commencement of Design.

Design of a project should not be initiated until the resources required (staff hours, consulting engineers, and construction funding) for completing the project have been identified using a 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.
- The financing and the cost, including the source of funds, and the appropriation status.
- A budget covering the project management or design staffing, survey staffing, construction inspection 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 by in-house staff or by consulting engineer;
  - Construction inspection by in-house staff or by consulting engineer;
  - Design survey and construction staking by in-house staff or consulting engineer;

  - Environmental assessment required;
  - Right-of-way acquisition required and, if so, the number of parcels and their locations and assessor parcel numbers;
  - Utilities that need to be relocated, problems with relocation and timing issues; and
  - Other key responsibilities that need to be assigned and/or accomplished.

- The extent of coordination necessary, listing the inter-agency coordination by division, department, or outside agency with whom coordination will be required in the design and construction of the capital project, the nature of the coordination, and the key contacts;
- 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 that 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, including 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; and

- Community relations and public information requirements, including public hearings or meetings and how the public will be informed and involved in the preliminary design and informed about the progress of the design and construction.

A design authorization form should be completed before commencement of design. It should be reviewed with the client department prior to the commencement of design.

Recommendation: A design authorization form should be completed by the Engineering Division before the commencement of design for each capital improvement project.

(2) Costs of Construction Guidelines Should Be Utilized to Document Resource Requirements for the Design and Inspection of Capital Improvement Projects.

The exhibit that follows 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."

Exhibit 12

Allocation of Staff Resources for Design and Inspection as a Median Percentage of Net Construction Costs

Type of Project	Street Construction				Street Reconstruction				Water/Wastewater/Storm Water				Traffic Control	
Level of Complexity	Above Average		Average		Above Average		Average		Above Average		Average		Average	
Construction Cost (+/-)	$0.25 million	$1 million	$0.25 million	$1 million	$0.25 million	$1 million	$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%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Design Development	10%	8%	9%	7%	13%	11%	10%	8%	9%	8%	8%	6%	8%	6%
Design Survey	1.5%	1%	1.5%	1%	1.5%	1%	1%	0.5%	1%	0.5%	1%	0.5%	1.5%	0.5%
Design Administration	2%	2%	1.5%	1.5%	2%	2%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Construction Survey	3%	2.5%	2.5%	2%	2%	1.5%	1.5%%	1%	2.5%	2%	2.5%	2%	0.1%	0.1%
Construction Inspection	5%	5%	4%	4%	5%	5%	4%	4%	4%	4%	4%	4%	3%	3%
Construction Management	3%	3%	2%	2%	3%	3%	1.5%	1.5%	3%	3%	2%	2%	2%	2%
Project Closure	0.4%	0.1%	0.4%	0.1%	0.4%	0.1%	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%	21.9%	19.6%	19.9%	16.6%	17%	13.7%

The following points should be noted concerning this cost of construction guideline.

- 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., Massachusetts Highway Department, the design complexities of the project, or problems with planning and construction 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.

- These guidelines are customized to fit the different types of construction jobs such as street construction, street reconstruction, sanitary sewer, etc.

- 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 current hourly cost of a consulting engineer for engineering work activities. Use of the hourly cost for a consulting engineer will level the playing field and ensure that the City's staff is every bit as productive and held as accountable as consulting engineers.

- The guidelines identify resource requirements for each work activity associated with a project. These include design development, design survey, design administration, etc.

- If a consulting engineer is accomplishing the design, the project manager in the Engineering and Design Division would utilize the guideline for design administration, and not design development.

- The engineers within the Division should utilize these guidelines to determine the staffing requirements for each project in terms of person hours required for design and construction inspection utilizing the cost of construction guidelines.

- The City Engineer should customize these costs of construction guidelines. The cost of construction guidelines should not be blindly utilized. These guidelines are just guidelines. The guidelines will need to be adjusted to local circumstances.

Recommendation: The Engineering Division should utilize cost of construction guidelines to document resource requirements for the design and inspection of capital projects.

(3) Develop a Monthly Capital Project Status Report.

Capital project status reports are not routinely provided to clients (other divisions / departments) whose capital projects are being designed and constructed by the Engineering Division so that the current status of projects is known. Comprehensive and useful project reports should be developed and provided to customers each month.

The monthly report should be developed and the following information should be included in this status report.

- The capital project number (based upon the number assigned in the capital improvement program);
- The capital project name;
- The project manager 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 project manager responsible for construction management.

  These project costs should be based upon a fully loaded hourly rate that includes indirect costs.

- 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.

This should be a simple report. The report should be published monthly, online on the Internet. After e-mail distribution of this status report, it should be the basis of a monthly meeting by the Engineering Division and the client departments or divisions.

Recommendation: The Engineering Division should develop a monthly capital project status report, and meet monthly with its client divisions / departments to discuss the status of the capital projects.

(4) The Engineering Division Should Utilize a Project Accounting System to Charge Actual Costs Associated with Design, Inspection and Construction of Capital Projects.

Currently, the Engineering Division budgets engineering salaries in both the City's General Fund and other capital projects within the City. Engineering salaries are allocated 10% to the General Fund, 30% to the Water Fund, 30% to the Sewer Fund, and 30% to Capital Projects. The balance is allocated to the City Capital Project Funds or the Water and Sewer Enterprise Funds.

When payroll costs are incurred, these payroll percentages are allocated to the City projects regardless of actual engineering workload. This is ineffective project management. Hours are not charged specifically to individual projects based upon

actual hours worked and accounting records are not created based upon the actual time spent working on the related jobs. An individual engineer could spend 100% of the entire payroll cycle working on a particular street improvement, yet only 30% of his salary will be coded to that particular project. Project management for the City should be designed so that accounting-related data; such as: City administration, in-house versus consultant design costs, and in-house versus consultant construction costs, and inspection fees should all be part of the accounting process.

A proper accounting of engineering records will allow the City to make better informed decisions as to whether particular projects were accurately projected thus making it easier to project future projects. Tracking employee hours by project also creates a level of accountability for the employee and their supervisor. If an engineer is assigned a project of $30,000, the City needs to know the true cost of that project. If the project comes in $15,000 over and that cost is all related to the hours charged to it by the engineer, then there could be a problem with the productivity of the employee.

Recommendation: The Engineering Division should develop and install a project accounting system and charge engineering design and construction management hours to projects based upon actual hours worked.

(5) 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 Engineering Division, and providing a convenient summary of the project.

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

- Project name, project number, and a description of the project. 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;
- The schedule for completion of the project – planned versus actual, including whether drawings, specifications, schedules, and cost estimates were prepared consistently according to schedule;
- The design costs for the project – planned and actual, including cost per sheet;
- Construction management costs – 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 staff of the Engineering Divsion. After distribution of this status report, it should be the basis of a meeting with the client department or division.

Recommendation: A final report should be prepared for capital projects upon completion of construction and acceptance of the improvements.

(6) Utilization Targets Should Be Established for the Engineering Division Staff.

To assure the staff of the Engineering Division is efficiently utilized, the City Engineer should set utilization targets for staff, assigned to the design, design administration, construction inspection, and construction management of capital improvement projects. These targets would represent that proportion of their work time that these staff would be billable to capital projects.

The project accounting system should be utilized to monitor the performance of these staff against these targets.

Recommendation: Utilization targets should be established for staff of the Engineering Division.

(7) Maintain a Summarized Twenty-Four Month Bar Chart Schedule for All of the Capital Projects That Will Be Designed and Inspected by the Engineering Division.

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 assessment, and construction. This schedule should be prepared for all capital projects that will be assigned to the Engineering Division during the next twenty-four months.

This bar chart should be updated on a monthly basis using Microsoft Project, and provided to the client divisions / departments.

Recommendation: The Engineering Division should develop a 24-month bar chart schedule for the design and construction of all capital projects, and update that chart monthly.

(8) A Design Report Should Be Completed When the Design Is No More Than 10% Complete.

The engineer assigned to the capital project as the project manager 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. This should be completed for significant and complicated capital projects, and not routine projects such as street resurfacing.

The design report should be prepared when the design is no more than 10% complete. The purpose of the design report is to serve as a preliminary design review to

enable the project manager to review and approve the proposed design approach. More specifically, the design report should:

- Briefly identify the capital project and describe 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 as a project manager should schedule a preliminary design review meeting. The engineer assigned to the project as a project manager, City Engineer, and a representative from the client division / department should attend this meeting.

At this meeting, the engineer assigned to the project as a project manager 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: A design report should be completed for each significant and complicated capital project when the design is no more than 10% complete.

(9) A Rating System Should Be Developed and Utilized to Evaluate the Performance of Each Consulting Engineer Utilized on Capital Projects.

The Engineering Division should develop a formal evaluation mechanism that rates each consulting engineer's performance as part of the close-out of each construction project. The consulting engineer's performance should be evaluated on factors such as:

- Ability to complete the project on schedule;
- Ability to complete the project within the established budget;
- Whether as-built documentation is provided and is accurate and thorough;
- Timeliness of communications to staff, including periodic status reports and early identification of potential issues that would impact the project's completion on time or within budget;
- Ability of engineer of record to perform the assigned duties within the budget agreed upon for professional services fees; and
- Quality of documentation provided on projects.

A simple rating scale should be applied to each factor rated, such as exceeded expectations, met expectations, and below expectations. An overall rating should be applied. Any consulting engineer's performance that receives an overall rating of below expectations should not be utilized for future projects.

Recommendation: The Engineering Division should implement a consulting engineer evaluation system and utilize this system as part of the final project close-out.

(10) A Project Management Manual Should Be Developed, and Staff Should Be Trained in Its Application.

At the present time, a project management manual is not in place within the Engineering Division. A project management manual is designed to provide guidance

and policies to those individuals assigned to oversee capital projects and assist them in the performance of their duties. A project management manual should address the following duties of the project manager:

- Planning the work;
- Estimating resources;
- Organizing the work;
- Acquiring resources (personnel and materials);
- Assigning tasks;
- Directing activities;
- Controlling project execution;
- Reporting progress; and
- Project close-out.

Each of these sections should include a detailed expectation of the project engineer for this task and any applicable policies and procedures. The value of a project management manual is not only to provide a resource for project managers to review established policies and procedures; but it assists in ensuring consistency by the project engineer. Additionally, it is a useful educational tool for employees and those clients who are working with the project engineer on a capital project.

Recommendation: The Engineering Division should develop a project management manual and train all professional and technical engineering staff in its use and application.

8. A USER FEE ANALYSIS SHOULD BE CONDUCTED TO ENSURE THAT ENGINEERING / DEVELOPMENT REVIEW FEES RECOUP THE FULL COST RELATED TO EACH OF ITS PERMITS.

It is a common best management practice across the country, that development fees are designed to recoup the fully loaded cost of issuing each permit and the related inspections that go along with that fee. The table below presents the list of the fees related to the Engineering Division.

General Fees Associated with Engineering Division - Estimate of Revenue					
Fee Category	**Fee Type**	**Unit**	**Unit Cost**	**Quantity**	**Revenue**
Sewer Connection Permits	Residential	Each	$100	80	$8,000
	Commercial/Industrial	Each	$200	10	$2,000
Sewer Extensions	Plan Review	linear foot	$1	2500	$2,500
	Construction Inspection	linear foot	$2	2500	$5,000
Drainage & Grading Plans	Residential Additions	each	$100	200	$20,000
	Residential New Construction	each	$200	80	$16,000
	Commercial/Industrial Additions	each	$200	10	$2,000
	Commercial/Industrial New Construction	each	$400	10	$4,000
Road Opening	Application	each	$200	500	$100,000
	Inspection	each	$300	250	$75,000
Drain Layer Applications		each	$100	100	$10,000
TOTAL ESTIMATED ANNUAL REVENUE					**$244,500**

The Engineering Division has not performed a comprehensive cost of service fee study to determine what the actual cost of providing the services listed above actually are for the Division. Recouping the fully loaded cost will enhance general fund revenues while at the same help the City to make more informed policy decisions concerning development. Recouping the fully loaded cost of these services will not deter

development; however, it may decrease profits recognized by developers that would have otherwise been funded by the City's General Fund.

Recommendation: The Engineering Division should perform a financial analysis of fees to determine the fully loaded cost of its operation.

9. THE ENGINEERING DIVISION SHOULD UPGRADE ARCVIEW AND AUTOCAD SOFTWARE TO CURRENT VERSIONS.

The Engineering Division currently uses version 14 of AutoCAD and version 3.2 of ArcView. These versions are out-dated and result in problems for staff of the Division in being able to review engineering designs prepared and submitted to the Division by consultants.

Engineering staff should be given the most recent versions of software and training in its use each year.

The approximate cost of the latest version of the new AutoCAD software would be approximately $4,000 per license while the ArcView software would be approximately $5,000 per license. The Division indicated that it is authorized three licenses for both AutoCAD and ArcView. The Division would require a total of $24,000 and $30,000 for AutoCAD and ArcView to upgrade these licenses to the most current versions.

Recommendation: The Engineering Division should keep license agreements up-to-date for both the ArcView and AutoCAD programs.

10. STAFFING ANALYSIS FOR THE ENGINEERING DIVISION INDICATES THAT ONE ENGINEERING POSITION SHOULD BE ELIMINATED.

The Engineering Division currently has four staff assigned to the design, review, and management of engineering projects related to water, sewer, and general fund capital projects. This includes the two (2) Assistant City Engineers, a Civil Engineer, and

a Junior Civil Engineer. In addition, a Senior Engineering Aide is largely dedicated to permitting and public counter services.

In order to analyze the staffing requirements necessary for Civil Engineering to manage the design and construction of capital projects, the project team utilized cost of construction guidelines. These guidelines have been assembled 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,* and the experience of the project team. 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 these guidelines.

- 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., Massachusetts Highway Department), the design complexities of the project, or problems with planning and construction.
- These guidelines are customized to fit the different types of construction jobs such as street reconstruction, traffic control, water and sewer, etc.
- 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 exhibit following this page presents the capital project management workload for the Engineering Division as of the beginning of March 2007 for engineering design and engineering construction management.

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Engineering Design Workload

Project Type	Project Title	Budget Amount	Design %	Design Insource/Outsource	Staff Hours
SEWER	Cip00-Kint Sewer Reconstruction	$312,500	100%	Outsource	0
SEWER	Cip 01-Sewer Essex Ave Upgrade	$482,000	100%	Outsource	0
SEWER	Cip03-Wpc Facility Capital	$3,600,000	95%	Outsource	0
SEWER	Cip04 Esp Stormwater Plan	$150,000	75%	Outsource	6
SEWER	Cip04 Cso Infill/Inflow Capital	$610,000	80%	Outsource	20
SEWER	Cip04 Sewer Proj Lower Essex/Gibbs Hill	$215,000	100%	Outsource	0
SEWER	Cip04 Trunk Sewer Cleaning/Inspection	$300,000	100%	Outsource	0
SEWER	Cip06 Cso Wpat	$27,025,000	60%	Outsource	1,802
WATER	Cip03- Water Lines Magnolia	$4,800,000	100%	Outsource	0
WATER	Dpw Asset Management Prog Cip 04	$65,000	100%	Outsource	0
GENERAL FUND	General Fund Landfill	$25,000	100%	Outsource	0
GENERAL FUND	General Fund Roadway	$300,000	60%	Outsource	5
GENERAL FUND	General Fund Dpw Yard	$50,000	100%	Outsource	0
WATER/SEWER	Adams Place Sewer & Water Extension Project	$250,000	100%	Insource	0
WATER/SEWER	Pond Road/Witham Street Sewer And Water	$1,400,000	100%	Insource	0
WATER/SEWER	Marble Road Sewer & Water Extension Project	$400,000	100%	Insource	0
WATER/SEWER	Gibbs Hill Drive Sewer & Water Project	$500,000	100%	Insource	0
DRAINAGE	Bass Avenue Drainage Project	$300,000	100%	Insource	0
DRAINAGE	Burnham Street & Thomas Court Drainage Project	$40,000	100%	Insource	0
CULVERT REPAIR	Dennison Culvert Repair Project	$10,000	100%	Insource	0
CULVERT REPAIR	Sleepy Hollow Culvert Repair Project	$40,000	0%	Insource	28
DRAINAGE	Washington Street Drainage Project	$5,000	100%	Insource	0
SEPTIC DESIGN	Wingaerhseek Septic Design	$50,000	50%	Insource	18
SEPTIC DESIGN	Residential Septic Design Approx 10	$150,000	100%	Insource	0
		$41,079,500			1,879

Engineering Construction Management Workload

Project Type	Project Title	Budget Amount	Construction %	Staff Hours
SEWER	Cip00-Kint Sewer Reconstruction	$312,500	100%	0
SEWER	Cip 01-Sewer Essex Ave Upgrade	$482,000	100%	0
SEWER	Cip03-Wpc Facility Capital	$3,600,000	0%	930
SEWER	Cip04 Esp Stormwater Plan	$150,000	0%	39
SEWER	Cip04 Cso Infill/Inflow Capital	$610,000	0%	376
SEWER	Cip04 Sewer Proj Lower Essex/Gibbs Hill	$215,000	100%	0
SEWER	Cip04 Trunk Sewer Cleaning/Inspection	$300,000	100%	0
SEWER	Cip06 Cso Wpat	$27,025,000	0%	6,981
WATER	Cip03- Water Lines Magnolia	$4,800,000	100%	0
WATER	Dpw Asset Management Prog Cip 04	$65,000	100%	0
GENERAL FUND	General Fund Landfill	$25,000	100%	0
GENERAL FUND	General Fund Roadway	$300,000	0%	78
GENERAL FUND	General Fund Dpw Yard	$50,000	100%	0
WATER/SEWER	Adams Place Sewer & Water Extension Project	$250,000	100%	0
WATER/SEWER	Pond Road/Witham Street Sewer And Water	$1,400,000	100%	0
WATER/SEWER	Marble Road Sewer & Water Extension Project	$400,000	100%	0
WATER/SEWER	Gibbs Hill Drive Sewer & Water Project	$500,000	100%	0
DRAINAGE	Bass Avenue Drainage Project	$300,000	100%	0
DRAINAGE	Burnham Street & Thomas Court Drainage Project	$40,000	100%	0
CULVERT REPAIR	Dennison Culvert Repair Project	$10,000	100%	0
CULVERT REPAIR	Sleepy Hollow Culvert Repair Project	$40,000	0%	25
DRAINAGE	Washington Street Drainage Project	$5,000	100%	0
SEPTIC DESIGN	Wingaerhseek Septic Design	$50,000	0%	31
SEPTIC DESIGN	Residential Septic Design Approx 10	$150,000	100%	0
		$41,079,500		8,459

- 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 current hourly cost of a consulting engineer for engineering work activities. Use of the hourly cost for a consulting engineer or consulting construction inspector will level the playing field and ensure that the City's staff is every bit as productive and held accountable as consulting engineers or consulting construction inspectors.

- The guidelines identify resource requirements for each work activity associated with a project. These include design development, design administration, construction management, construction inspection, project closure, etc.

Important points to note about these projects are presented below.

- Based upon feedback from Civil Engineering, it is assumed that the design of all of these projects will be accomplished by consulting engineer.

- Cost of construction guidelines were applied to these projects and an hourly rate of $120 for engineering staff for design and construction management was utilized to determine the number of hours required for the staff of Engineering. These hourly rates have been utilized by the project team in urbanized areas and represent the estimated equivalent costs for consulting engineers or consulting construction inspectors.

- The cost of construction guidelines were developed by the project team, and have been utilized by the project team in numerous management studies of engineering services.

- The design workload for these projects amounts to an estimated 1,879 staff hours or the equivalent of 1.3 staff years. This includes design planning and scoping and design administration. Almost all of this design workload consists of the combined sewer outfall project (project #600000.10.442.58249).

- The largest proportion of workload that appears to be facing Engineering is construction management and inspection resulting from several large and complicated construction projects. The total demands amount to an estimated 8,459 staff hours. Some of these projects – such as the combined sewer outfall project – will take more than two years to accomplish, and the required staff hours would be allocated over a two-year period.

In addition to the capital improvement projects, Engineering Division staff are responsible for performing development related services, including grading and

drainage plan reviews, supervision and maintenance of the pavement management system and the geographic information system and other special projects relating to the City's environmental and coastal needs. Given the roles and responsibilities of the Engineering Division, the project team recommends the following:

- The City Engineer should continue to allocate the majority of his time to the management of the division, although for large projects, such as the combined sewer outfall, the participation of the City Engineer should be expected;
- The two Assistant City Engineers should continue with the management and supervision of capital projects, including the supervision of the Civil Engineer position with respect to the design and construction management of capital projects.
- The Civil Engineer should continue with the management and supervision of capital projects.
- The Senior Engineering Aide position should continue to be primarily responsible for the plan checking and issuance of permits and public counter coverage.

The Junior Civil Engineer position should be eliminated. The estimated annual cost impact associated with the elimination of this position is presented in the table below.

Annual Cost Increase		Annual Cost Decrease	
N / A	$0	Eliminate a Junior Civil Engineer position	$67,300

Recommendation: Eliminate the Junior Civil Engineer position.

8. ANALYSIS OF OPERATIONS

8. ANALYSIS OF THE OPERATIONS DIVISION

The Operations Division of the Public Works Department is responsible for the maintenance and repair of the City's water, sewer, and highway infrastructure. The Operations Division consists of a Highway Section, Water Section and Sewer Section. Both the water and wastewater treatment plants are managed and operated by a private vendor. The management of those contracts is the responsibility of the Environmental Engineering Division.

1. THE CITY SHOULD INSOURCE STREET SWEEPING AND INCREASE THE LEVEL OF SERVICE.

The City has provided street sweeping services with staff from the Highway Section, Operations Division, Public Works Department. The points, which follow, present a summary of the level of service for street sweeping and the existing equipment.

- The service level objective for street sweeping has been once annually for residential streets beginning in April with an estimated completion in six to eight weeks. For the downtown, the service level objective for street sweeping was weekly street sweeping services from April through October.

- Additionally, the City provides street sweeping services in advance of, and after, special City events and responds to miscellaneous requests for street sweeping services.

- The City has 285 curb miles of residential streets and 11 curb miles of downtown streets. The table, below, presents a summary by ward.

- The Department utilizes the following staff to perform street sweeping services:

  – Two Special Motor Equipment Operators operate the street sweepers;

  – Depending on the type of equipment and route location, the Department utilizes another Heavy Motor Equipment Operator to operate a dump truck to collect, transport, and dispose of debris collected by the sweepers; and

– On average, the annual spring street sweeping program takes up to eight weeks of dedicated labor hours to complete utilizing the two street sweepers. This includes downtime for equipment repairs.

- The Department is authorized two street sweepers – both regenerative air street sweepers. Pertinent information regarding these sweepers is presented in the table below.

Vehicle #	Model Year	Date in Service	Date Out of Service	Life-To-Date Odometer Reading
681	2000	9/3/1999	9/30/2005	3,447
682	2000	9/30/1999	9/30/2005	3,056

Over a six-year period, these two street sweepers were utilized for a total of 6,503 hours, an annual average total of 1,083 hours, or 542 hours annually for each street sweeper.

- The sweepers were taken out of service at the end of September 2005.

- In June 2006, the City of Gloucester contracted for street sweeping services. The points, below, provide a summary of the scope of services. The contactor was responsible for the following:

  – To furnish and supply mechanical broom sweeper with an operator for the purposes of sweeping public and private streets within the City;

  – To provide sweeping services on an hourly basis (rate of pay) for 8-hour shifts from June, 2006 through August, 2006 dependent on weather conditions;

  – To perform services as required (i.e., day or night, Monday through Friday);

  – To maintain the sweeper at the contractor's expense and provide a replacement sweeper if downtime sweeping exceeded 8 hours; and

  – To provide daily maintenance and cleaning of the sweeper as part of the 8-hour shift, not exceeding 30 minutes.

  The City's responsibilities were as follows:

  – To provide one chase truck for the contractor's sweeper and to dispose of all material collected; and

  – To provide fuel to the sweeper while performing duties in the City.

The City's 2006 costs for contractual street sweeping amounted to $26,138 for 307.5 hours of street sweeping by the contractor. The table, which follows, provides the data collected by the City of Gloucester with respect to contractor performance for street sweeping services.

Date	Total Machine Hours	Miles Traveled	Hours Billed	Cost @ $85 per Hour
06/12/06	–	–	8.0	$680
06/13/06	–	–	8.0	$680
06/14/06	–	–	8.0	$680
06/16/06	–	–	8.0	$680
06/19/06	–	–	8.0	$680
06/20/06	–	–	8.0	$680
06/21/06	–	–	8.0	$680
06/22/06	–	–	8.0	$680
06/22/06	–	–	8.0	$680
06/23/06	–	–	8.0	$680
06/23/06	–	–	6.0	$510
06/26/06	–	–	6.0	$510
06/27/06	5	–	6.0	$510
06/28/06	6	–	8.0	$680
06/29/06	8	18	8.0	$680
06/30/06	6	18	8.0	$680
07/03/06	8	11	8.0	$680
07/05/06	6	9	7.5	$638
07/06/06	5	11	5.5	$468
07/07/06	7	9	8.0	$680
07/10/06	7	12	8.0	$680
07/11/06	8	19	9.5	$808
07/12/06	5	14	8.0	$680
07/13/06	5	16	8.0	$680
07/14/06	6	15	7.0	$595
07/17/06	4	25	7.0	$595
07/18/06	8	25	9.0	$765
07/19/06	6	24	8.0	$680
07/20/06	7	16	8.0	$680
07/21/06	1	4	1.0	$85
07/24/06	7	19	8.0	$680
07/25/06	7	26	8.0	$680
07/26/06	7	28	8.0	$680
07/27/06	5	25	8.0	$680
07/28/06	6	28	8.0	$680
07/31/06	5	14	6.0	$510
08/01/06	5	26	8.0	$680
08/02/06	6	26	7.0	$595
08/03/06	2	–	3.0	$255
08/04/06	–	–	3.0	$255
08/07/06	–	–	8.0	$680
08/08/06	5	10	8.0	$680
Total	**163**	**448**	**307.5**	**$26,138**

The points, which follow, provide a brief discussion of the data presented in the above table.

– The contractor provided the Department with data pertaining to work activities, including total machine hours, as well as miles driven. The data did not include actual miles swept (e.g., 'broom down.')

– Additionally, complete data on machine hours and mileage for the duration of the contract was not provided to the City.

– The table, below, provides a summary of the contractor data. As shown, the net hours worked assumes total billed hours less machine hours. As noted, the contractor did not provide the City will actual number of curb miles swept. However, mileage traveled data were provided to the City and average just under eighteen miles per day.

Average Per Shift	Mon.	Tues	Wed.	Thurs.	Fri.	Average
Number of Machine Hours	6.2	6.3	6.0	5.3	5.2	5.8
Number of Miles Traveled	16.2	21.2	20.2	17.2	14.8	17.9
Net Hours Worked (Hours Billed Less Machine Hours)	7.4	8.1	7.8	7.1	6.3	7.3
Number of Miles Traveled per Billed Hour	1.9	2.5	2.6	1.9	2.2	2.2

– In addition to the cost per hour paid by the City to the contractor for services, the City provided: (1) "chase" dump truck to collect, transport, and dispose of debris collected by the sweepers staffed with one City employee and (2) fuel for the street sweeper.

The City issued an Invitation to Bid in fiscal year 2006-07 for street sweeping services. Two bids were received: one from RPM Service Inc. and the other from American Sweeping. These bids are presented in the two tables below.

1 RPM SERVICE Inc.				
Service	**Workload**	**Frequency**	**Cost / Unit**	**Total Annual Cost**
Spring Street Sweeping	267 curb miles	Annual	$185 / curb mile	$49,395
Downtown litter sweeping	11 curb miles	31 times annually	$70 / curb mile	$23,870
Special events	276 hours	Annual	$91.50 / hour	$25,254
Spring Sweeping Disposal	1,000 tons	Annual	$52 / ton	$52,000
Downtown Sweeping Disposal	100 tons	Annual	$156 / ton	$15,600
Special Events Disposal	100 tons	Annual	$156 / ton	$15,600
TOTAL				**$181,719.00**

2. American Sweeping				
Service	**Workload**	**Frequency**	**Cost / Unit**	**Total Annual Cost**
Spring Street Sweeping	267 curb miles	Annual	$291.50 / curb mile	$77,830
Downtown litter sweeping	11 curb miles	31 times annually	$43.18 / curb mile	$14,724
Special events	276 hours	Annual	$95 / hour	$26,220
Spring Sweeping Disposal	1,000 tons	Annual	$72 / ton	$72,000
Downtown Sweeping Disposal	100 tons	Annual	$72 / ton	$7,200
Special Events Disposal	100 tons	Annual	$72 / ton	$7,200
TOTAL				**$205,174**

Excluding the cost for disposal of the materials collected by the sweepers, the contractors costs for providing this service ranged from a low of $98,519 for RPM Service Inc., to a high of $118,774 for American Sweeping.

These two bids – including the cost of disposal – significantly exceed the costs incurred by the City in 2006 for contractual street sweeping services – a total of 307 hours at a cost of $26,138. There are a number of reasons for this including the reallocation of fiscal responsibility for disposal of the material collected from the City to the contractor and the elimination of the provision of a “chase” dump truck to collect, transport, and dispose of debris collected by the sweepers by the City.

The project team evaluated an alternative to the use of contractors for the provision of street sweeping services. That alternative would involve the use of City-purchased street sweepers and staff from the Highway Section, Operations Division, Public Works Department to deliver street sweeping services. Implementation of this alternative would require the following actions.

(1) Replacement of the City's Two Existing Street Sweepers.

The City's existing street sweepers have clearly reached the end of their useful life. Under the alternative for delivery of street sweeping services by the Highway Section, Operations Division, Public Works Department, these two street sweepers would need to be replaced. There are alternative types of street sweepers that could be purchased.

- **Mechanical Broom Sweeper**. A significant percentage of the sweepers used in the United States are traditional mechanical broom sweepers. With some variations, the process removes debris by sweeping material with gutter brooms rearward into the path of a pick-up broom. The pick-up broom sweeps the material moving it upward with a conveyor system into a hopper. Most new mechanical sweepers have been certified to clean to the PM 10 standard. There are advantages and disadvantages to mechanical broom sweepers.

  – Advantages: Ability to pick-up gross pollutants (trash, road debris, vegetation). Good for picking up wet vegetation, gravel and coarse sand. Some models can conduct dry sweeping operations. These units are very good in roadways with heavy loads of materials, such as sand.

  – Disadvantages: The overall maintenance requirements for mechanical sweepers are more than those for vacuum-assisted and regenerative air sweepers since mechanical sweepers contain more moving parts that require periodic replacement. In fact, the cost of maintenance and repair of a mechanical broom sweeper – based upon several sources – is approximately twice as high as a regenerative air sweeper. The mechanical broom must spin its brooms for optimal sweeping performance. A reduction in rotation speed results in poor sweeping and increased cost.

- **Regenerative Air Sweeper**. While the California air quality situation requiring PM 10 controls and sweeper certification resulted in industry equipment changes, mechanical sweepers were slowly being replaced or augmented by regenerative-air technology. Regenerative-air technology attempts to increase the removal of both coarse and fine materials on typical pavement with cracks or uneven sections where sediment would become lodged. To capture sediments, these sweepers are equipped with gutter brooms and a pick-up head. The gutter brooms direct materials towards the pick-up head. The regenerative-air process blows air into one end of the horizontal pick-up head and onto the pavement dislodging materials entrained within cracks and uneven pavement. The other end of the pick-up head has a suction hose that immediately vacuums out the materials within the pick-up head into a hopper. There are advantages and disadvantages to regenerative air sweepers.

  – Advantages: Regenerative air sweepers are generally more efficient than mechanical broom sweepers at removing finer sediments, which often bind a higher proportion of heavy metals. Regenerative air sweepers are better able to pick-up most gross pollutants (trash, road debris, vegetation) and especially coarse, as well as some fine grained materials entrained within cracks and uneven pavement sections that mechanical brooms cannot reach. They also have significantly greater pick-up of soluble pollutants and fine road surface materials than mechanical sweepers, and some units can operate in a dry mode. Research by the City of Toronto in 2005 found "clear evidence that regenerative-air street sweepers are the most PM 10 and PM 25 efficient in the category of new technology street sweepers, and that they clearly outperform mechanical [broom] street sweepers." Toronto also valuated the operational performance of regenerative-air sweepers. The City found that the "regenerative air sweeper effectively met key operational requirements such as:

    •• Efficient leaf and heavy silt loading pick-up;

    •• Efficient pick-up of large debris;

    •• Ability to operate during wet conditions (rain);

    •• Ability to operate below zero temperatures; and

    •• Ability to operate in a dry, dustless mode."

  – Disadvantages: Regenerative air sweepers have a higher initial capital outlay than mechanical broom sweepers – approximately 28% higher. However, the regenerative air sweeper has a longer life span than mechanical broom sweepers. When considering the longer life span, the annualized capital outlay for the regenerative air sweeper is only 9%

higher than that of a mechanical broom sweeper.

- **Vacuum sweeper wet or dry (high efficiency)**. In the last fifteen years, vacuum street sweepers were developed in an attempt to remove the coarse and fine materials within the typical pavement structure. Both the regenerative air and vacuum sweepers may be the technology that succeeds at providing routine cost-effective and pollutant source control. These units will have gutter brooms and strong vacuum heads for picking up both coarse and fine materials. While some models use water as a dust suppressor, others can operate in a dry mode. There are advantages and disadvantages to mechanical vacuum sweepers.

  – Advantages. Vacuum sweepers are able to pick up most gross pollutants (trash, road debris, and vegetation). These units are believed to be more effective than regenerative air and mechanical sweepers for pollutant removal associated with fine particles and can operate in a dry mode.

  – Disadvantages. In general, these units do not pick up wet vegetation or large road debris. The sweeping action of gutter brooms may still expose fine silts for wash off into the catch basin and storm sewers.

The City of Gloucester faces different challenges in sweeping its streets. In the spring, the City faces the challenge of sweeping sand placed in the roadway for traction during snowstorms. It faces the ongoing challenge of collecting trash, road debris, and vegetation. In the fall, it faces the challenge of leaf collection. However, the project team recommends that the City purchase a new regenerative air sweeper and a used mechanical broom sweeper. This would provide the best combination of sweeping technology. The regenerative air sweeper would be utilized for the sweeping of downtown and the proposed second sweeping of residential streets in the City, and the second sweeper when the Department sweeps streets in tandem in the spring.

The cost for these two street sweepers – one (1) new regenerative air sweeper as the primary sweeper and one used mechanical broom sweeper as a backup is presented in the table below.

Street Sweeper	Purchase Price	Depreciation Cost
Tymco Regenerative Air Sweeper Model 500x - New	$180,000	$25,700
Mechanical Broom Sweeper - Used	$75,000	$18,750
TOTAL		**$44,450**

The total cost would approximate $44,450 annually. This presumes a seven (7) year life for the regenerative air sweeper, and a four (4) year life for the used mechanical broom sweeper.

The City can purchase the new Tymco regenerative air sweeper model 500x using the Plymouth County Cooperative Purchasing Program. This purchase should be made using tax-exempt five-year lease purchase financing. It should also purchase a used mechanical broom street sweeper. This could also be purchased using tax-exempt lease purchase financing, but the project team would suggest a four-year term.

The Public Works Department has suggested the purchase of two new street sweepers model. The lease purchase costs for two new sweepers, when considering the costs of labor and operating and maintenance costs for the equipment, would result in a higher cost than that of the lowest bid submitted by RPM Service Inc. In addition, the usage of the street sweepers – approximately 542 hours annually each – does not warrant two new street sweepers.

(2) Allocation of 1,100 Staff Hours Annually by the Staff of the Highway Section, Operations Division, Public Works Department to the Provision of Street Sweeping Services.

In order to determine the required labor resources, the project team utilized the following assumptions.

- Each street sweeper would continue to be operated by a Special Machine Equipment Operator.

- Special Machine Equipment Operators are Grade 6's. The salary range for this position is $15.72 to $20.34 per hour for a forty-hour workweek. The median hourly wage for this position is $17.70. This is based on the AFSCME A Group contract and salary adjustment amendments of 1.75% effective July 2005, January 2006, and 2% increases occurring in July 2006 and January 2007.

- The benefit rate is estimated to be approximately 35% of base salary. This was estimated by the City's Personnel Department.

- The project team utilizes a benchmark of between 22 and 28 curb miles per operator per shift. This includes preparation and travel time, and breaks.

- The City of Gloucester estimates current performance of 24.5 curb miles swept per shift, which falls within the benchmark. However, it is assumed that during the annual spring-cleaning program, the average number of curb miles swept per shift would decrease (e.g., due to slower travel speeds, excessive sand on roadways, etc.) to 15 curb miles per shift.

- The table, which follows, presents the labor hours required for delivery of street sweeping services utilizing in-house labor.

	Residential – Spring	**Residential – Fall**	**Downtown**	**Misc. / Special Events**	**Total**
Number of Curb Miles	296.4	296.4	11.0	84.0	687.8
Frequency of Street Sweeping	1.0	1.0	31.0	1.0	-
Total Number of Annual Curb Miles Swept	296.4	296.4	341.0	84.0	1,017.8
Number of Curb Miles Per Shift	15.0	24.5	24.5	24.5	-
Number of Work Days Required	19.8	12.1	13.9	3.4	49.2
Number of Work Hours	158.1	96.8	111.3	27.4	393.6
Median Hourly Rate of a SMEO	17.7	17.7	17.7	17.7	-
Benefit Rate	0.4	0.4	0.4	0.4	0.4
Total Hourly Cost	23.9	23.9	23.9	23.9	23.9
Total Labor Costs	3,776.5	2,312.2	2,660.0	655.0	9,403.7
5% Contingency on Labor Hours	7.9	4.8	5.6	1.4	19.7
Contingency Cost	188.8	115.6	133.0	33.0	355.0
Total Estimated Labor Costs	**3,965.4**	**2,427.8**	**2,793.0**	**688.0**	**$9,874.1**

As shown in the above table, the delivery of street sweeping services by the Highway Section, Operations Division, Public Works Department, requires less

than 500 staff hours annually. This includes the sweeping of residential streets twice a year, a level of service that is higher than the current level of service.

The Highway Section, Operations Division, Public Works Department has the staff capacity to increase the level of service for residential street sweeping beyond twice annually. Sweeping streets an additional six times annually, beyond that presented in the table above, would require an additional 500 staff hours annually. This is well within the staff capacity of the Highway Section, Operations Division, Public Works Department and would result in more effective utilization of the City's investment in its street sweepers.

(3) Operating and Maintenance Costs for the Two Regenerative Air Sweepers Should Approximate $18,100 Annually.

The two regenerative air street sweepers should not be a significant operating and maintenance expense. The project team, based upon their experience with other fleets, believes the cost should approximate $3 per mile. The two sweepers in the City's fleet were driven a total of 37,050 miles in their life-to-date, or 6,175 miles over their five-year life span. The estimated annual cost for the operation and maintenance of the two regenerative air sweepers is presented in the table below.

Annual Miles	Mechanic Labor Costs	Sweeper Parts	Fuel for Street Sweepers	Total O & M Cost
6,175	$7,900	$4,300	$5,900	$18,100

Overall, the cost for operation and maintenance of these two street sweepers would approximate $18,100 on an annual basis.

* * * * * *

Overall, the project team believes that the Highway Section, Operations Division, Public Works Department can sweep the City's streets for less than the most recent bid received by the City for contractual street sweeping. The project team estimates that the annual cost to the City for the provision of street sweeping services using the staff of the Highway Section would approximate $86,000 annually excluding disposal costs. The

low bid received by the City form RPM Services Inc. was $98,519, excluding disposal costs.

Recommendation: The City should purchase one (1) new Tymco 500x regenerative air street sweeper through Cooperative Purchasing Program specifications and one (1) used Tymco 500x regenerative air street sweeper, and surplus its existing two street sweepers.

Recommendation: The City should purchase these two regenerative air street sweepers using tax-exempt lease purchase financing.

Recommendation: The City should provide street sweeping services with staff resources provided by the Highway Section.

Recommendation: The Public Works Department should increase the level of service provided for street sweeping. Residential streets should be swept twice a year. Downtown streets should be swept once a week.

(4) The Public Works Department Should Recycle the Sand That It Collects in the Spring.

The two bids received by the City included estimates for disposal of street sweeping material. For the material collected during the spring residential street sweeping, the estimates ranged from $52,000 to $72,000. The total street sweeping disposal costs proposed by the two bidders for spring residential street sweeping, commercial street sweeping, and special events ranged from a total of $83,200 to $86,400.

The City will face the same range of disposal costs for the materials that it collects during its sweeping of residential streets. It should explore alternatives to the disposal of its street sweeping material.

For example, the City of Haverhill Highway Department also has a sweeping program to collect the sand spread over the streets during the winter. This material is brought back to the City's corporation yard, mixed with the excavated hot top and

material accumulated through the year, and then put through a crushing operation allowing the City to use a recycled product in its trenches as opposed to buying new gravel.

The project team recommends that the Public Works Department develop alternatives to recycle the material collected by street sweepers.

Recommendation: The Public Works Department should recycle the sand that was spread over the streets during the winter.

(5) The Public Works Department Should Utilize a Number of Best Practices for Its Street Sweeping Program.

If the Public Works Department is going to insource street sweeping, it should utilize best management practices in the delivery of these services. The best management practices recommended by the project team for street sweeping are presented below.

- **Training of Street Sweeper Operators**. Find a highly skilled sweeper operator with many hours of experience and train (one-on-one) new operators or those with less experience. Operators with less experience are more likely to make costly mistakes. As with other types of equipment that typically requires only one on-board operator, (airplanes for example) beginners benefit greatly from a skilled professional before they are allowed to solo. This also applies to mechanics responsible for maintenance and adjustments to the machine.

- **Use A Small Pool of Street Sweeper Operators**. For each sweeping machine owned by Gloucester, there should be a primary Special Machine Equipment Operator assigned to operate it. There should also be a back-up person that the regular Special Machine Equipment Operator would work with. The benefit of this arrangement is that Special Machine Equipment Operators feel both pride in, and responsibility for, the expensive piece of equipment they are assigned to use. By working on it exclusively, the Special Machine Equipment Operator becomes familiar with its personality and quirks, and can develop a skill that gets the most from the machine.

- **Combine Two 15-Minute Coffee Breaks Into One 30-Minute Morning Break**. This recognizes that although coffee breaks are to be 15 minutes, they often last longer – perhaps 20 or 25 minutes, especially when sweepers are in

neighborhoods where there are few toilet facilities and coffee vendors. By combining these two times, the extra time used is reduced, resulting in more work accomplished.

- **Work Ten-Hour Shifts**. The use of a 10-hour shift reduces the amount of dead time that results from breaks, get ready and cleanup in the morning and the afternoon, etc.

- **Use Larger Capacity Dump Truck Equipment If Available**. Substitute a tandem-axle dump truck to receive and haul sweeping debris from sweeper rather than a single-axle dump truck. Cost difference is minimal in the maintenance and repair costs of the truck, but capacity increases by 100 percent.

- **Provide Street Sweeping Services to Other Municipalities Through Contract Arrangements**. If a sweeper is idle for part of the spring and fall, consider providing contract sweeper services to a neighboring jurisdiction.

- **Eliminate Use of the Water Spray Function on the Sweeper, by Purchasing a Dustless or Dry Sweeper**. This reduces time needed to stop and refill the sweeper's relatively small water tank and reduces its weight. It would also do less damage to soft roads in spring and improve gas mileage. Furthermore, the spray has limited effect in controlling dust.

- **Where Winter Debris Is Heavy and Requires Two Passes, Use Two Sweepers In Tandem and Make Only One Pass**. Alternate the sweepers – as the first sweeper picks up most of the debris, when it dumps into the truck, the second sweeper takes the lead (leap-frog) and the first one then follows until the lead sweeper dumps its load, and the cycle repeats itself.

- **Develop a Sweeping Grid on Paper for Operators to Follow, to Enable Sweepers to Make Right Turns Most of the Time**. Routes with mostly right turns improve performance because there will be minimal conflict with other traffic and also the sweeper can be operating (sweeping) continuously.

- **Develop Performance Standards and Apply Them Equally to Gloucester Sweeper Operators**. Specify what areas are to be worked on, what is to be picked up and in what amount of time. Determine an acceptable level of cleanliness.

- **Establish and Maintain a Parking Ban to Aid Street Sweeping and Snow Removal**. Various options could be used to make this effective – different days, or different sides of the street (odd would be swept one day, and even another day), streets (residential or commercial). Without a ban, streets need to be swept again, increasing costs proportionately.

- **Find Less Expensive Ways to Dispose of Sweepings**. Establish a program to recycle aggregate for winter ice control. This could reduce the amount of aggregate to purchase for the following year. Recycle used aggregate in a 50/50 mixture with new aggregate. Also, this reduces the costs of hauling the debris long distances to landfills, and reduces the cost of land-filling.

- **Require the Winner of Sand Bid to Accept Spring Sweepings from the City**. Most contractors have equipment to recycle this material and reuse it in other grades of material.

- **Maintain Clean Streets in Construction Areas by Assessing a Street and Storm Sewer Cleaning Fee as Part of Building Permits.** Use the fee to reimburse the City for the costs of sweeping streets on or near construction zones on an as-needed basis and have them deposit the dirt back onto the developer's lot. Require the developers/builders to erect and maintain "silt fences" to keep erosion from streets. If left unchecked, this erosion could eventually plug newly installed storm sewers in those developments.

Recommendation: The Public Works Department should implement a number of best practices for sweeping of the City's streets.

(6) The Public Works Department Should Report Its Service Efforts and Accomplishments For Street Sweeping.

The City will be expending approximately $86,000 annually to sweep its streets. To assure that the City's investment in this service is cost effective, the Highway Section, Operations Division, Public Works Department should be required to report to the Mayor and the City Council on a monthly basis during the sweeping season (beginning of April through the end of November) with the following data:

INPUTS

- Current budget and actual for street sweeping

- Number of street-cleaning vehicles

- Number of personnel hours dedicated to street sweeping in the last month and year-to-date

OUTPUTS

- Tons of refuse collected
- Number of curb-miles cleaned (broom down)
- Percentage of street-miles receiving a regular street sweeping broken down by residential and commercial

OUTCOMES

- Number of valid citizen complaints regarding street cleanliness
- Percentage of scheduled cleanings not completed on schedule broken down by residential and commercial

EFFICIENCY

- Cost per ton of refuse collected
- Cost per curb mile of street cleaned (broom down)

The Highway Section needs to be held accountable for the level of street sweeping service and the productivity of its staff.

Recommendation: The Public Works Department should develop a monthly report that documents the curb miles swept – including residential curb miles swept – downtown, tons of debris collected, staff hours allocated to street sweeping, and curb miles swept per staff day.

2. THE CREW SIZE USED FOR POTHOLE PATCHING SHOULD BE REDUCED TO TWO PERSONS, USING PLACE AND ROLL TECHNIQUES AND APPLYING PROACTIVE POTHOLE PATCHING SERVICES BASED UPON SNOW PLOW ROUTES.

At present, the Highway Maintenance Section uses a three-person crew for pothole patching. The size of the crew should be reduced to two persons. This is a standard crew size for pothole patching, and reflects a reduced crew size to reduce the labor hours lost due to unproductive travel time.

The method that the City should use most often is "place and roll," or "quick response" pothole patching. This method utilizes a two-man patch crew in a small dump truck assigned to repair potholes in specific areas in the City. The areas or routes should be assigned on a rotating basis, and all streets within the City covered within a two-week period. At times, this may require the assignment of two crews.

Recommendation: The crew size for pothole patching should be reduced from three to two persons.

Recommendation: A "place and roll" approach to pothole patching should be utilized.

Recommendation: Pothole patching services should be provided proactively based upon routes, such as snowplow routes, and all streets in the City covered in a two-week period.

3. THE AMOUNT OF STAFFING FOR THE HIGHWAY SECTION SHOULD BE REDUCED BY FOUR POSITIONS.

The Highway Division is authorized twelve (12) staff. This includes the Highway Foreman. The roles and responsibilities of these staff are presented below.

Staffing By Classification		Roles and Responsibilities
Working Foreman	1	• Oversees the daily operations related to the City's Highway Department. • Plans and assigns daily workloads for staff. • Responsible for personnel-related activities including timesheets, leave requests, etc.
Highway Maintenance Craftsman	1	• Provides street sweeping services for the City (currently being contracted out due to broken-down sweepers). • Provides street maintenance repairs primarily related to pothole patching. • Provide roadside brush cutting services to DPW, as well as wetsheds. • Installation and repair of damaged guardrails. • Installation and repair of City sidewalks. • Provides snow and ice road maintenance services for the city. Supervises contractors related to snow and ice. • Repairs manholes, catch basins, and curbstones. • Provides roadside cleanup related to debris and accidents.
Heavy Equipment Motor Operator	1	
Special Equipment Motor Operator	3	
Highway Maintenance Man	3	
Mason	1	
Traffic Maintenance Man	1	

Staffing By Classification		Roles and Responsibilities
Sign Painter	1	• Paints and refurbishes city signage. • Repairs and erects city signage.

Compared to its peers, the level of staffing for Highway Maintenance in Gloucester is greater than typical (see the table below)

City	No. of Staff	No. of Lane Miles	FTE Staff Per 100 Lane Miles
Gloucester	12	182	6.59
Easton	9	288	3.13
Falmouth	19	218	8.72
North Kingstown	16	210	7.62
Worcester	25	883	2.83
Beverly	11	371	2.96

The following points present a discussion of information collected regarding street maintenance in each of the local governments.

- As shown in the table above, the number of staff per 100 lane miles staff ranged from a low of 2.83 lane miles in Worcester to a high of 8.72 miles per FTE in Falmouth. Gloucester's level of staff per 100 lane miles is lower than Falmouth and North Kingston, but higher than that of Easton, Worcester, and Beverly.

- Most of the local governments contracted out similar street maintenance work as Gloucester, including paving, crack sealing and overlay as well as sidewalk repair and construction.

- Falmouth, North Kingstown and Worcester's average turnaround time for potholes to be patched after a complaint is received is within one (1) business day. The Town of Easton's average turnaround time is within four (4) hours. Gloucester and Beverly's goal is to fill potholes within two to three days.

- All of the local governments have implemented a crack-sealing program, which is performed by contract.

- Gloucester has similar snow plowing practices as the comparative agencies. All local governments dedicate City staff to snow plowing, as well as utilize a mix of in-house staff from different divisions and contractors.

As these points indicate, the mix of services delivered by in-house staff and by contract in Gloucester was not that different than these other five (5) cities.

The project team evaluated the level of staffing required for highway maintenance. The exhibit, on the following page, presents the project team's assessment of workload and staffing requirements for pavement maintenance and repair.

Important points to note concerning the exhibit are presented below.

- There are an estimated 260 staff days required for pothole patching on an annual basis. This work activity should use a two-person crew, and not the three-person crew currently utilized. The annual quantity proposed in terms of tonnage is a high amount, and presumes an asphalt crew would be maintained on a year round basis, either for pothole patching or base repair.

- There are an estimated 448 crew days required for base repair on an annual basis. This work would be performed using a 4-person crew. This activity would be performed eight months a year (April through November).

- Street sweeping of the downtown would require an estimated 14 staff days annually. This would be performed with a one-person crew. This activity would be performed eight months a year (April through November).

- Street sweeping – residential spring sweeping would require an estimated 107 staff days annually. This would be performed with a three-person crew: two street sweepers and a dump truck. This activity would be performed two months a year (April through May).

- Street sweeping – residential fall sweeping would require an estimated 12 staff days annually. This would be performed with a one-person crew. This activity would be performed two months a year (September through November).

- Street sweeping miscellaneous (special events such as parades, accident cleanup, etc.) would require an estimated 34 staff days a year.

- Pavement legend painting would require an estimated 42 staff days annually. This work activity should use a two-person crew. This activity would be performed eight months a year (April through November).

- Parking lot and curb painting would require an estimated 7 staff days annually. This work activity should use a two-person crew. This activity would be performed eight months a year (April through November).

Activity Name	Inventory Measure	Units	Annual Quantity		AWQ[1]	ADP[2]	Crew Days	Crew Size	Staff Days
			Per Inventory	Unit					
Pothole Patching	2-lane miles	182	Tons Mix	2	364	3	130.0	2	260.0
Base Repair	2-lane miles	182	Square Yards	40	7280	65	112.0	4	448.0
Street Sweeping - Downtown	Curb Miles	11	Curb Miles	31	341	25	13.9	1	13.9
Street Sweeping - Residential / Spring	Curb Miles	285	Curb Miles	1	285	8	35.6	3	106.9
Street Sweeping - Residential / Fall	Curb Miles	285	Curb Miles	1	285	25	11.6	1	11.6
Street Sweeping - Miscellaneous	Person Hours	276	Person Hours	1	276	8	34.5	1	34.5
Pavement Legend Painting	Square Feet	13,308	Square Feet	1.0	13,308	640	20.8	2	41.6
Parking Lot & Curb Painting	Linear Feet	3,329	Linear Feet	1.0	3,329	960	3.5	2	6.9
Sign Maintenance & Repair	Sign	380	Sign	1.0	380	10	38.0	1	38.0
Snow and Ice Control	Person Hours	2880	Person Hours	1.0	2,880	8	360.0	1	360.0
Misc. Street Maintenance	Person Hours	612	Person Hours	1	612	8	76.5	1	76.5
Sub-Total									**1,397.9**

[1] AWQ = Annual Work Quantity
[2] ADP = Average Daily Productivity

- Sign maintenance and repair would require an estimated 38 staff days annually. This work activity should use a one-person crew. This activity would be performed eight months a year (April through November).

- Miscellaneous street maintenance would require an estimated 77 staff days annually. This activity would be performed eight months a year (April through November).

Altogether, a total of 1,186 staff days would be required. Given the eight months available for highway maintenance, this would indicate a need for six staff, and the Working Foreman and the Mason. This would represent a reduction of four (4) positions.

The Public Works Department has responded to the previous annual work program with its own work program. There are a number of issues with that annual work program. These issues are presented below.

- The Department has proposed to allocate 326 staff days to street sweeping. That significantly exceeds the amount of hours charged by the private contractor for sweeping streets in 2006 (a total of 38.4 days), the labor days previously allocated by the Public Works Department when it previously provided this service (a total of 93.6 staff days), and the labor days the project team believes is necessary to provide an improved level of service (168 labor days).

- The amount of staff days allocated to miscellaneous work activities far exceeds that experienced in other cities. This includes such activities as brush cutting for the watershed and roadsides (90 staff days annually), soils separation and handling (130 days annually), and compost facility maintenance (72 days annually), etc. These three activities alone amount to one staff year.

- The amount of staff days allocated for sign maintenance amounts to one staff year. This is a far higher level of service than warranted for a City with the number of lane miles as Gloucester.

While the effort of the Public Works Department to develop an annual work program represents a good first effort, the goal seemed to be allocating existing and

authorized positions among work activities rather than an assessment of staffing requirements based upon workload.

The estimated annual cost impact associated with the elimination of the four positions is presented in the table below.

Annual Cost Increase		Annual Cost Decrease	
N / A	$0	Eliminate a Sign Painter position and three Highway Maintenance Man positions	$183,600

Recommendation: Eliminate a Sign Painter and three Highway Maintenance Man positions.

4. IN THE MID-TERM, THE NUMBER OF STAFF AUTHORIZED FOR THE WATER DISTRIBUTION SYSTEM SHOULD BE REDUCED BY THREE POSITIONS, BUT IN THE INTERVENING TIME, STAFF SHOULD BE UTILIZED FOR GATE VALVE EXERCISING, GATE VALVE REPLACEMENT AND MINOR MAIN REPLACEMENT.

There are a total of eleven positions allocated to the water distribution system.

Staffing By Classification		Roles and Responsibilities
Working Foreman	1	• Oversees the daily operations related to the City's Water Department. • Plans and assigns daily workloads for staff. • Responsible for personnel related activities including timesheets, leave requests, etc.
Water System Maintenance Craftsman Heavy Motor Equipment Operator Hydrant & Valve Maintenance Man Special Equipment Operator Water System Maintenance Man	2 3 1 2 4	• Provides the maintenance and management of the City's water distribution system. • Repair, maintenance, and painting of hydrants including flushing of hydrants. • Repair, maintenance, and installation of City water lines. • Responsible for locating water utilities for dig safe hotline. • Responds to customer requests for service calls. • Currently trying to replace water valves throughout the City.

The level of staffing for the maintenance and repair of the water distribution system in Gloucester is somewhat higher than its peers as indicated in the table below.

Local Government	No. of Staff	Miles of Water Mains	Miles per FTE
Easton	23	157	6.8
Gloucester	13	115	8.8
Worcester	50	600	12.0
Falmouth	19	376	19.8
Beverly	7	160	22.9

The number of miles of water mains per full-time equivalent for water operations ranged from a low of 6.8 (Easton) to a high of 22.9 miles per FTE (Beverly). Gloucester was only slightly above Easton at 8.8 miles per technician.

To evaluate the level of staffing, and provide an effective level of service for preventive maintenance of the water distribution system, the project team documented the staffing required by Water Distribution. The staffing analysis is presented below.

Work Activity	Units	AWQ[1]	ADP[2]	Annual Crew Days	Crew Size	Annual Staff Days
Water services - replaced	Service	36	1.5	24	3	72.0
Water taps	Taps	24	3	8.0	3	24.0
Water services - repaired	Service	24	2.8	8.6	3	25.7
Water main repair	Main breaks	24	1.5	16.0	3	48.0
Fire hydrant - repair	Hydrants	24	4	6.0	2	12.0
Fire hydrant - replacement	Hydrant	12	1.2	10.0	2	20.0
Fire hydrant - move/relocate/raise	Hydrant	6	4	1.5	2	3.0
Valve - repair/replace	Valve	300	1.6	187.5	3	562.5
Exercise gate valves <10"	Valve	2,000	20	100.0	1	100.0
Exercise gate valves >10"	Valve	1,000	13	76.9	2	153.8
Fire hydrant preventive maintenance	Fire Hydrants	2,000	12	166.7	1	166.7
Pressure reducing valve preventive Maintenance	Valve	1	2	0.5	2	1.0
Commercial meter testing	Meter	35	4	8.8	2	17.5
Residential meter replacement	Meter	775	12	64.6	1	64.6
Meter maintenance & repair	Meter	89	10	8.9	1	8.9
Flush deadends	Deadends	24	16	1.5	1	1.5
Clean water storage tanks	Person Hours	168	8	21.0	1	21.0
Underground service alerts	Alerts	360	20	18.0	1	18.0
Leak detection	Person Hours	640	8	80.0	2	160.0
Replace MXV	MXV's	850	18	47.2	1	47.2

Work Activity	Units	AWQ[1]	ADP[2]	Annual Crew Days	Crew Size	Annual Staff Days
Miscellaneous water maintenance and repair	Person Hours	1,700	8	212.5	1	212.5
Air release valve repair	Valve	4	3	1.3	1	1.3
Air vacuum / pressure release valve preventive maintenance	Valve	50	8	6.3	1	6.3
TOTAL STAFF DAYS						**1,747.5**

[1] AWQ = Annual Work Quantity
[2] ADP = Average Daily Productivity

Important points to note concerning the table are presented below.

- Valve repair / replacement would require an estimated 562 staff days annually. This assumes an estimated 10% of the valves would need to be replaced annually. The Department is not preventively maintaining valves at present. The preventive maintenance of valves, something the Division has not historically performed, will likely result in a higher than usual number of replacements required initially.

- Exercising distribution valves would require an estimated 253 crew days annually.

- Hydrant preventive maintenance would require 167 staff days annually – a full-time job.

- Commercial meter testing – recommended annually by the American Water Works Association – would require an estimated 35 staff days annually.

- Leak detection – a recommended program – would require an estimated 160 crew days annually.

- Miscellaneous water maintenance would require an estimated 212 staff days annually.

Altogether, an estimated 1,747 staff days would be required annually, or 9 full-time staff, excluding a supervisor. Three positions should be eliminated. This is fully and easily achievable, particularly the proposed reallocation of the Meter Reader and Water Meter Installer from Central Services to this Section. That would place this Section in a well-staffed position with no inability, due to lack of staff, to effectively preventively

maintain the water distribution system in accordance with American Water Works Association.

The project team does **not** recommend the immediate elimination of these positions. These positions should be eliminated through attrition. In the intervening time, there is work that is currently being outsourced that these three positions, plus other remaining staff in the Division, could be utilized to accomplish. This work includes the following:

- **Valve Exercising**. This work was recently outsourced. This is clearly mainstream work that should be accomplished by in-house staff under any circumstances. There is clearly more than sufficient staff in the Division to perform this work on an annual ongoing basis. The annual work program on the previous pages included this work activity and staff days for this effort. The City should **not** outsource this work.

- **Valve Replacement / Repair.** The annual work program included this work activity. This is repair work that should, in most circumstances, be performed with in-house staff. Some aspects of this work should be outsourced such as the line stop services that would require specialized equipment. However, the other work associated with gate valve replacement should, under most circumstances, be accomplished with in-house staff supplemented by a line stop contractor where necessary. This work should only be done in-house when the in-house staff demonstrates, consistently, the ability to preventively maintain the water distribution system.

Three positions should be eliminated. The estimated annual cost impact associated with the elimination of the three Laborer positions is presented in the table below.

Annual Cost Increase		Annual Cost Decrease	
N / A	$0	Eliminate three Water System Maintenance Man positions through attrition.	$137,700

Recommendation: Eliminate three Water System Maintenance Man positions through attrition.

Recommendation: Exercise valves with in-house staff.

Recommendation: Replace gate valves, in most instances, with in-house staff complementing these efforts with a line stop contractor.

5. ESTABLISH A COMPREHENSIVE PREVENTIVE MAINTENANCE PROGRAM FOR THE WATER DISTRIBUTION AND PRODUCTION SYSTEM.

There are a number of shortcomings regarding the preventive maintenance of the water distribution system. These shortcomings include the following:

- The Department does not have a formal program to proactively and routinely exercise water distribution valves;
- Dead-ends in the water distribution system are flushed due to dirty water complaints, or only on an as-needed basis;
- Air release valves are checked and maintained on an as-needed basis;
- Residential water meters are only evaluated for accuracy if there is deemed to be a problem with the meter stemming from a large water consumption increase associated with the residence;
- Multi-family water meters are only changed out if a problem is perceived with the meter through a customer complaint;
- Water pump station inspections, which include thermographic imaging, vibration analysis, ultrasonic analysis, laser alignment, and dynamic balancing, are not conducted; and
- Water loss is approximately 22.23%.

There are clearly a number of opportunities for improvement in the maintenance and repair of the water distribution system.

Preventive maintenance involves a planned and managed program of inspection, adjustment, lubrication, replacement of components, and performance testing and analysis on a routine, ongoing, scheduled basis. The objective of preventive maintenance includes:

- Prevention of downtime of critical systems and equipment;

- Extension of the life of facilities and equipment;
- Improvement of equipment reliability;
- Reduction of revenue lost through leaking mains, inaccurate registration of water meters, etc.

Currently the water distribution system is not being comprehensively maintained. The levels of service for preventive maintenance of the City's water distribution system do not meet guidelines established by such organizations as the American Water Works Association, as indicated in the table below.

Water Infrastructure	Current Frequency	Recommended Frequency
Water distribution system valves – Inspect and exercise valves. Re-pack, maintain as necessary.	There are 1,516 valves. The Section does not routinely exercise valves.	Water distribution valves are inspected and preventively maintained not less than once every two years depending on valve size.
Hydrants – Inspect and exercise hydrants. Repack, maintain as necessary.	The 822 fire hydrants are not been preventively maintained.	Fire hydrants are inspected and preventively maintained annually.
Water Tanks – Inspect including internal inspection by divers. Maintain/repair based on inspection results.	Water storage tanks are checked and preventively maintained every four to five years..	Water storage tanks are checked and preventively maintained every four to five years.
Pressure Regulating Valves (PRV) – Inspect; exercise, rehabilitate, maintain as necessary.	Pressure regulating valves are not inspected and preventively maintained.	Pressure regulating valves are inspected and preventively maintained annually.
Air vacuum / pressure release valves are inspected and valves preventively maintained and rebuilt if necessary.	Air vacuum / pressure release valves are inspected when they break.	Air vacuum / pressure release valves are checked and preventively maintained on a bi-annual basis,

Water Infrastructure	Current Frequency	Recommended Frequency
Residential meters are replaced to assure that these meters maintain registration accuracy.	Residential water meters are only evaluated for accuracy if there is deemed to be a problem with the meter stemming from a large water consumption increase associated with the residence.	Residential meters are replaced on a fifteen to twenty year schedule.
Commercial meters	Multi-family and commercial water meters are only changed out if a problem is perceived with the actual meter through a customer complaint.	Commercial meters are tested for registration accuracy once a year.

A number of key preventive maintenance tasks – essential to the reliable operation of the water distribution system – are not being performed or not being performed to the standards adopted by the American Water Works Association or those developed by the project team. These include the following:

- **Valve Exercising**. A valve exercising program is required to assure valves are clean and operable, extend their life, and pinpoint problem valves to schedule time for repair or replacement. Valve exercising should occur annually for valves larger than 10 inches and bi-annually for valves smaller than 10 inches. Proper exercising of valves includes the following tasks:
  - Cleaning dirt and debris out of the valve box;
  - Closing and opening the valve until it operates freely;
  - Replacing missing or defective operating nuts;
  - Lubricating and greasing gears;
  - Checking the packing and replacing if necessary; and
  - Checking the by-pass valve.
- **Fire Hydrant Maintenance**. A fire hydrant maintenance program is necessary to assure proper operations of the fire hydrant. Hydrant maintenance by a water crew can consist of water-related operations only, or can also include such tasks as removing brush from around the hydrant, painting, etc. Hydrant maintenance

should occur annually. Water-related tasks include:

– Flushing the hydrant (often accomplished during non-drought seasons).

– Lubricating hose, nozzle caps and threads.

– Replace missing or defective caps or nozzles.

– Check for leakage and tighten / recaulk nozzles or replace packing or O-rings.

– Flow test and pressure check.

– Verification / Recordation of hydrant location.

- **Commercial / Industrial Water Meter Testing and Rebuilding**: The purpose of commercial and industrial water meter testing is to assure accuracy of the meter as commercial and industrial water meters register a much greater water usage, and thus represent a proportionally larger revenue mechanism as compared to residential meters. Commercial and industrial meters are classified as those 3" and greater – the City has 475 of these meters that represents 4.4% of all meters in the City. According to AWWA, meters 1.5" to 2" cannot be field tested per se, and thus require removal, shop check, and reinstallation or replacement. Meters larger than 2" are field-tested every one to three years dependent upon size. Generally, 15% to 20% of the commercial and industrial require rebuilding.

- **Residential Meter Exchange Program**. A residential meter exchange program – meters 2" and smaller – is required to replace old substandard meters with meters that provide accurate readings. The schedule for replacement is dependent upon conditions that impact the aging of equipment – weather, quality of the water, etc. These factors vary. However, replacement schedules often incorporate a fifteen to twenty-year schedule.

- **Leak detection program**. The benchmark used by the project team is water loss is less than 4% (in terms of the difference between the volume of water distributed versus the volume of water sold). The water loss for the City of Gloucester is 22%. Water loss is especially important given the cost of treating water.

The management and supervisors of the Water Section should develop and install a preventive maintenance program to address these deficiencies.

Recommendation: Managers and supervisors of the Water Section should be held accountable for the consistent preventive maintenance of valves, fire hydrants,

meters and air vacuum / pressure release valves.

Recommendation: Managers and supervisors of Water Section should consistently dedicate staff to the preventive maintenance of valves, fire hydrants, meters, and air release valves.

Recommendation: Preventive maintenance should be accorded the second highest work priority – after emergency repairs – and not an "as time permits" priority.

Recommendation: The Water Section should allocate not less than one hundred sixty (160) staff days annually to leak testing.

6. WATER DISTRIBUTION AND PRODUCTION SHOULD INITIATE A LEAK DETECTION PROGRAM.

A detailed water audit and leak detection program of forty-seven California water utilities found an average loss of 10 percent and a range of 30% to less than 5% of the total water supplied by the utilities.

Leaks in distribution systems can occur in different components: transmission pipes, distribution pipes, service connection pipes, joints, valves, and fire hydrants. Causes of leaks include corrosion, material defects, faulty installation, excessive water pressure, water hammer, ground movement due to drought or freezing, and excessive loads and vibration from road traffic.

Leaks waste both money and a precious natural resource, and create a public health risk. The primary economic loss is the cost of raw water, its treatment, and its transportation. Leakage leads to additional economic loss in the form of damage to the pipe network itself, e.g., erosion of pipe bedding and pipe breaks, and to the foundations of streets. Risk to public health can be caused by contaminants entering the pipe through leak openings if water pressure in the distribution system is lost.

Evolving technology is aiding leak detection. While leak detection surveys can be

expensive and labor intensive, leak noise correlators can be utilized to mitigate this expense. These are portable microprocessor-based devices that pinpoint leaks automatically based on the cross-correlation method. In this method, acoustic leak signals are measured with vibration sensors or hydrophones at two pipe contact points (usually fire hydrants or valves) that bracket the location of a suspected leak. Leak signals are transmitted from the sensors to the correlator wirelessly. The leak is in most cases located asymmetrically between measurement points and consequently there is a time lag between the measured leak signals. The time lag is found from the cross-correlation function of the leak signals. In the presence of a leak, the cross correlation function has a distinct peak at the time shift between leak signals. The location of the leak is calculated based on an algebraic relationship between the time lag, the sensor-to-sensor distance, and the propagation velocity of sound waves in the pipe. The distance between sensors is measured on site or read from distribution system maps.

Recommendation: Water Distribution and Production should initiate a leak detection program.

7. THE NUMBER OF STAFF AUTHORIZED FOR THE WASTEWATER COLLECTION SYSTEMS IS SUFFICIENT GIVEN THE COMPLEXITY OF THE SYSTEMS.

There are a total of eight positions allocated to the wastewater collection and stormwater collection system. This includes the Sewer Foreman (see the table below).

Working Foreman	1	• Oversees the daily operations related to the City's Sewer Department. • Plans and assigns daily workloads for staff. • Responsible for personnel related activities including timesheets, leave requests, etc. • Supports the wastewater plant by providing heavy equipment to clean pump stations wet wells, assist with tank cleaning and line clearing at the treatment plant.

Sewer Systems Maintenance Craftsman Heavy Equipment Operator Special Motor Equipment Operator Sewer System Maintenance Man	1 1 3 2	• Provides the maintenance and management of the City's sanitary sewer collection system. • Responsible for sanitary system related to both the City's sewer step system and septic system, which use grinder pumps. • Assists outside vendor with preventive maintenance related to sewer step system by pumping all solids from internal pots. • Responsible for pumping of all solids from grinder pumps when breakdowns occur. • Cleans grease traps and septic systems for parks, beaches and schools. • Responsible for all repairs outside internal septic pots. • Periodic cleaning of catch basins. • Jet rods any clogged sewer lines. • Repair, maintenance, and installation of City sewer lines. • Responsible for locating sewer utilities for dig safe hotline.

This staff is responsible for the maintenance of approximately 78 miles of wastewater mains.

This staff is not cleaning wastewater mains on a regular ongoing basis. This staff is not cleaning catch basins on a regular ongoing basis. The Sewer Section has sufficient staff to deliver these services. Given the complexity of these wastewater collection systems, the level of staffing cannot be adjusted, particularly considering the lack of preventive maintenance.

Recommendation: Maintain the existing level of staffing for wastewater collection.

Recommendation: The Working Foreman should be held accountable for the development, installation, and delivery of a preventive maintenance system for catch basins and wastewater collection systems.

8. INSTALL A FORMAL WORK PLANNING AND SCHEDULING SYSTEM.

The Operations Division is responsible for the maintenance and repair of aging infrastructure. This requires that the talents and skills of staff be planned and scheduled so that these resources can be effectively utilized to maintain and repair this aging infrastructure.

With increasing responsibilities, the efficiency of Operations Division staff resources easily becomes a first priority. Unless work is effectively planned and scheduled, the Operations Division will experience a slippery slope as less work is completed, more failures occur and the time of Operations Division staff is spent repairing failures, not on preventing the failure from happening. The only way to break this cycle is a systematic approach maintenance planning and scheduling.

Planning and scheduling for the Operations Division must be a disciplined approach for utilizing its staff resources. This is accomplished through:

- Prioritizing work;
- Developing the physical steps to complete the job;
- Procuring necessary tools and materials;
- Scheduling the work to be done;
- Completing the work; and
- Identifying any additional work to be completed on the asset.

The Operations Division should take a number of steps to install a planning and scheduling system. These steps are presented below.

- **Create and utilize work orders for all of the work performed by Operations Division staff**. The work order should serve as the basis for identification of requests for services, or work. A work order does basic things for the Operations Division. First, it alerts the responsible unit (Highway, Sewer, Water) of a requirement for services. Second, the work order describes the work or services to be performed. Third, the work order authorizes expenditures for the described work (Highway, Sewer, Water). Finally, an effective work order system will enable tracking of performance in the accomplishment of such work. The Operations Division is able to know when the work was required, when it was completed, who performed the work, and the cost of performing that work. Thus the work order system is the backbone of a planning and scheduling system.

  The work order should include the date, name of the requestor, location of the work, nature of the work, priority of the work, etc.

- **A three to six month schedule should be prepared**. A three to six month schedule is a process of balancing workload, both current and anticipated workload demand. This is especially important for the Operations Division given the lack of a preventive maintenance program and the recommended reductions in authorized staff. By defining the current workload and anticipating future workloads, the Operations Division will be able to make an informed decision on the amount of work that can be accomplished given the staff resources available. The Operations Division staff resources must be balanced with the workload so that there are enough people and materials to accomplish the work, but not more people and materials than needed or more workload than can be realistically accomplished. This can be accomplished by documenting the available work hours and then documenting work hours required for concrete maintenance repair, street maintenance and repair, and signs and marking maintenance and repair given the backlog, given service requests received, etc.

- **Develop a weekly schedule.** The weekly schedule for the Operations Division is the plan for assigning staff resources to specific jobs in the coming week. The weekly schedule is normally developed on a Wednesday or Thursday of the preceding week. The assignment of staff resources is based on several factors:

  – Available work hours. This can be affected by planned leave, holidays, attrition, and other factors.

  – Available materials and equipment. To accurately schedule, materials planners must communicate realistic delivery dates for necessary materials.

  – Rate of success in the current week's schedule.

  – Priorities. The overall plan of the master schedule becomes a guide in developing priorities for the weekly schedule.

  A weekly schedule does not necessarily define the work of individual staff, but rather the number of hours by a crew to be spent each day on specific work orders.

- **The work should be tracked and reported**. Tracking work progress and reporting on work progress is another important part of the planning and scheduling system. Reporting on work is the process of communicating with management and customers the current progress and the current plans for a\ preventive maintenance, repairs, etc. Weekly schedule compliance is an effective method of tracking progress. For instance, how close was the actual weekly execution of the work in relationship to the plan developed in the weekly schedule? How effectively is the preventive maintenance being accomplished?

The planning and scheduling system allows the Operations Division to manage what, when, how, how much, and how well the Operations Division performs its work. The system can be complex and computerized, with full scheduling and tracking controls, or more informal, with a minimum of control. The Operations Division must find the right balance of control to enable it to meet its goals and objectives in supporting the Department's mission.

Recommendation: The Operations Division should develop and install a formal work planning and scheduling system.

9. THE CITY SHOULD ACCEPT THE PRIVATE ROADS THAT HAVE BEEN PAVED WITHIN THE CITY IF THE ROADS ARE IN FAIR OR BETTER CONDITION.

The City's Chapter 90 funding has varied significantly over the past several years. The City of Gloucester currently receives approximately $400,000 in Chapter 90 State highway repair assessments each year. This is the primary funding source for the repair and maintenance of the City's streets.

An alternative for the City to increase its Chapter 90 funding is to accept privately paved streets. If most, if not all, roads in Gloucester (not including State roads) were public, the City would collect approximately $214,000 more in Chapter 90 revenue this year alone.

Before accepting these roads, the Engineering Division should evaluate each road to evaluate the pavement condition to determine the costs of upgrading these roads to acceptable condition. In evaluating the condition of these roads, the following data should be collected.

- Street Name

- From and To – Identify road (connecting streets) found at its start and end (if any).
- Length – Record odometer reading to nearest 1/10 mile.
- Width – Pace the width of the traveled way and record to the nearest yard. For lengthy roads, several sections should be paced to determine an average width.
- Road Surface - Identify dirt or gravel roads as dirt and treated or paved roads as "treated" for each surface type on each road.
- Housing Factor – Use the following factors for various housing conditions:
  - Fifteen houses or less
  - More than 15 but not exceeding 30
  - More than 30 but not exceeding 45
  - More than 45
- Artery Factor - Identify the road using one of the following descriptions:
  - Minor Residential – Road provides access to houses primarily on that street.
  - Residential Collector – Road feeds into subdivision providing primary access to houses on other streets.
  - Through Connector – Road serves as primary connector between two major roads.
- Surface Factor – Identify the road surface condition using the following factors:
  - Very Good – Road surface generally smooth, can travel at legal speed without damage or loss of control.
  - Good – Road surface somewhat rough, can travel at legal speed with moderate care.
  - Fair – Road surface rough in many locations, can travel at slightly below legal speed with moderate care.
  - Poor – Road surface rough in many locations, can travel only at speeds

substantially below legal limit.

– Very Poor - Road surface very rough throughout, travel on road must be very slow and erratic to avoid damage or loss of control.

Recommendation: The Engineering Division should conduct an evaluation of private roads to assess their condition.

Recommendation: The City should accept those private roads that are in fair to very good condition and that meet the width requirements of the zoning ordinance.

10. THE CITY SHOULD EVALUATE THE ALLOCATION OF STAFF TO THE SEWER FUND.

The City allocates a significant number of staff to the Sewer Enterprise Fund. In fact, almost 17 full-time equivalent positions are allocated to the sewer fund.

In some cases, the appropriateness of these allocations does not appear to be justified. For example:

- One-third of the Public Works Department Confidential Secretary is allocated to the sewer fund;
- 30% of the Senior Engineering Aide is allocated to the sewer fund; and
- One-third of the Storekeeper is allocated to the sewer fund.

Basic cost allocation methodologies stress consistent treatment of costs. Currently, the City is not consistently defining what are direct and indirect costs. The most significant issue is the policy of directly charging salaries of staff to the sewer fund without documented rationale beyond initial estimates of time. In fact, several positions are charged directly to the sewer fund and staff cannot define the basis for how the percentages were originally derived.

Recommendation: The City should develop policies to determine which costs should be allocated directly to the sewer fund and which costs should be allocated through an indirect cost allocation plan.

Recommendation: The City should make the effort to document which staff members work directly with the Sewer Enterprise Fund and the amount of time each position typically spends over the course of a year. This process should include sampling of workload, time recording to identify specific activities spent during the course of several pay periods, and annual review of duties to ensure the position duties and responsibilities have not changed substantially.

Recommendation: The City should develop a comprehensive cost allocation plan with narrative that explains the process of cost allocation of administrative and other indirect costs.

9. ANALYSIS OF PUBLIC PROPERTIES

9. ANALYSIS OF THE PUBLIC PROPERTIES DIVISION

This chapter of the report analyzes the operations of the Public Properties Division of the Public Works Department. This division is responsible for the maintenance and repair of City property, including public facilities, as well as grounds maintenance. Grounds maintenance includes all grass cutting, seasonal trash removal, beach cleaning, maintenance of athletic fields and parks, installation and maintenance of playgrounds and maintenance of public cemeteries. In addition to grounds maintenance, this Division oversees the repair and maintenance of all public facilities including maintenance of service contracts, fuel and utilities. The Public Properties Division is assigned ten and half (10.5) full-time equivalent staff and approximately 52 seasonal positions.

1. THERE ARE A NUMBER OF OPPORTUNITIES FOR IMPROVEMENT IN THE WORK PRACTICES AND MANAGEMENT SYSTEMS OF THE PUBLIC PROPERTIES DIVISION.

In completing the organization and management analysis of the Public Works Department, the project team made an assessment of the improvement opportunities of the Public Works Department. The opportunities for improvement in the Public Properties Division are presented below.

- No formal policy exists regarding the periodic inspection of building component conditions.
- The City does not have a comprehensive list of building systems and equipment with information such as location, model type, warranty information, age, and replacement parts.

- The City does not have a preventive maintenance program for its building facilities and components.
- A tree inventory including location, size, species, and condition does not exist.
- Work in the Public Properties Division is scheduled on a day-to-day basis primarily through customer call-in requests, which are distributed to the Working Foreman.
- Approximately 95% of trees are trimmed primarily based on call-ins or emergency situations.
- Formal service level standards have not been developed for parks, parks, fields and open space.
- An annual work plan has not been developed for the City's parks, fields and open space.
- Periodic inspections of playground equipment is done on a random monthly basis.

These opportunities for improvement served as the basis for the development of recommendations by the project team.

2. THE CITY OF GLOUCESTER SHOULD AUTHORIZE A BUILDING MAINTENANCE CRAFTSMAN.

The Public Properties Division is responsible for facilities maintenance with respect to the general maintenance (e.g., carpentry, HVAC, locks, plumbing, etc.) as well as managing $84,000 in facility maintenance contracts.

The City of Gloucester has two fulltime equivalents responsible for the building maintenance functions. The table, which follows, provides a summary of the facilities this Division is responsible for maintaining.

Building	Square Feet
DPW Highway Barn	19,878
DPW Sewer Barn	4,224
DPW Water Barn	15,311
DPW Public Properties Barn	4,800
Little House	640
City Hall	34,636
Sawyer Free Public Library	28,097
Central Fire Station	11,872
Bayview Fire Station	2,919
West Gloucester Fire Station	2,976
Magnolia Fire Station	4,625
Blynman Schoolhouse	4,446
Visitor Center	4,576
Rose Baker Senior Center	10,736
Fitz Huge Lane House	1,780
Good Harbor Concession	2,304
Wingersheek Concession	3,913
Veterans Center	5,212
Police Station / Courthouse	29,179
City Hall / Annex	10,560
American Legion Hall	3,824
Total Square Feet	**206,508**

The Public Works Department is authorized two (2) staff for building maintenance and repair: a Senior Building Maintenance Craftsman and a Carpenter. The points, below, provide the assumptions utilized in the development of staffing calculations and recommendations.

- The project team utilized a benchmark of 50,000 square feet per maintenance and repair FTE for finished space (e.g., assumes a highly utilized space, higher rates of wear and tear, more components and elements requiring maintenance and repair, such as locks, electrical, HVAC systems, etc.).

- Additionally, the project team utilized a benchmark of 100,000 square feet per FTE with respect to additional facilities square footage. A higher ratio of square feet to FTEs is assumed for space where usage is low (e.g., basements, attics, etc.), but would still require maintenance and repair activities.

- The project team assumed a net availability of 85%, which includes leave time usage (e.g., vacation, sick, training, etc.).

The table, below, presents the staffing calculations for maintenance and repair.

	Finished Area	Other Space
Total Square Footage	124,420	82,088
Benchmark (sq. ft. per FTE)	55,000	100,000
Number of FTEs Required	2.26218182	0.82088
Number of FTEs Required		**3.1**
Total Current FTEs		**2.0**
+/ (-) FTEs		**1.1**

As noted, the Public Properties Division has only two staff allocated to building maintenance services: a Senior Building Maintenance Craftsman and Building Maintenance Craftsman. The project team recommends the addition of a Building Maintenance Craftsman to provide maintenance services. While this position will provide general building maintenance services, it is recommended that the position have journey-level experience in one of the key building trades (e.g., HVAC, plumbing, or electrical). The table, which follows, presents a summary of the costs associated with this recommendation.

Recommendation: Authorize a Building Maintenance Craftsman position.

Recommendation: Reduce the contracts for electrical, plumbing and HVAC by approximately one-third.

Cost Increase		Cost Decrease	
Authorize a Building Maintenance Craftsman position.	$50,600	Reduce the contracts for HVAC, plumbing, and electrical by approximately one-third	$15,000

3. THE CITY OF GLOUCESTER SHOULD DEVELOP FORMAL PROGRAMS TO IMPROVE THE MANAGEMENT OF BUILDING MAINTENANCE SERVICES.

The City of Gloucester should develop preventive maintenance programs for its building maintenance functions. Currently, the Building Maintenance functions are

reactive – responding to request for service and complaints as necessary. This should include the following:

(3.1) Create a Comprehensive Inventory of Building Assets.

The Governmental Accounting Standards Board Statement 34 requires state and local governments to begin reporting the value of their infrastructure assets. The accurate reporting of the value of these assets necessitates a comprehensive inventory of assets. In addition, the *American Public Works Association*, in their Public Works Management Practices Manual, a guide to accreditation of public works departments, recommends the development of a comprehensive inventory including building assets.

Additionally, a comprehensive asset inventory will provide information for the Public Works Department to make more informed resource allocation decisions. The City, with a comprehensive asset inventory for its building assets, can make sounder decisions regarding how tax dollars should be used, particularly as it concerns funding for renewal and rehabilitation of existing building assets versus the construction of new assets.

The Public Works Department should develop a comprehensive inventory of building assets and their components in conjunction with the implementation of a computerized maintenance management system. Computerized maintenance management systems rely on comprehensive asset inventory data. With the technological advances in recent years, tools are now available to create an effective asset management system. These systems no longer require large investments of resources or a lengthy education process. These tools can be made accessible to nearly all employees and the public. Automating the once manual system of managing

assets does more than increase speed and efficiency of the process; it also ensures that the maintenance and repair of these assets are more effectively managed.

Recommendation: The Department of Public Works should develop a comprehensive inventory of building assets and their components. This should be done in conjunction with the implementation a computerized maintenance management system.

(3.2) Conduct Periodic Ongoing Condition Assessments.

The American Public Works Association, in their *Public Works Management Practices Manual,* a guide to accreditation of public works departments, recommends the condition assessment of assets on an ongoing basis. The lack of ongoing condition assessments limits the Department's ability to identify major deficiencies early when timely repairs will be much less costly and risks to the public are less.

The Public Works Department does not have a formal process in place to document and monitor the condition of each facility. Further, the Department of Public Works has not established a formal program in which the condition of public facilities are assessed, document, and incorporated into the short- and long-term planning needs of the Department (e.g., relative to funding and maintenance programs). The Division does not conduct ongoing condition assessments of buildings to identify deferred building renovation and rehabilitation that should be addressed through capital improvement projects.

Condition assessments are needed to identify the various types of backlog maintenance projects for City buildings and estimate the amount of funding needed on an ongoing basis to improve the life-safety aspects of the building, reduce further deterioration of the building components, comply with current building and safety codes

and ensure that the buildings operate as designed, both structurally and mechanically.

The Public Works Department should conduct condition assessments of City facilities on a five to seven year cycle to identify the backlog of renovation and rehabilitation requirements and deficient conditions. Information collected during periodic condition assessments are utilized:

- To calculate the costs for renovation and rehabilitation projects, utilizing R.S. Means Corporation's published construction and remodeling cost estimating data and format.
- To rank and prioritize all renovation and rehabilitation projects by severity and anticipated life cycle.
- To create an updated database for maintaining project data, modeling existing data to determine future funding requirements, and monitor ongoing code compliance/plant adaptation issues.

Recommendation: The Department of Public Works should conduct periodic condition assessments of City facilities.

(3.3) Develop a Preventive Maintenance Program for Major Building Systems and Components.

Many building industry and facility management groups, including the *American Public Works Association, the Building Owners and Managers Association (BOMA) International, the Association of Physical Plant Administrators (*now named the *Association of Higher Education Facilities Officers),* and the *Association of School Business Officers* agree on the benefits of well-planned preventive maintenance.

These professional associations cite preventive maintenance for its effects on improving equipment's operating efficiency, preventing premature replacement of components, and avoiding interruptions for building occupants. Preventive maintenance is widely thought to reduce long-term costs by maximizing the operating capacities of

equipment, minimizing downtime, and avoiding breakdowns that would otherwise lead to higher repair costs later. Although we found no studies that quantified specific costs and benefits of a comprehensive preventive maintenance program for buildings, some studies demonstrate efficiencies of planned maintenance and others show the relationship between building maintenance and reducing building deterioration. Studies within individual companies show savings in energy costs and repair costs, as well as reductions in equipment breakdowns, due to preventive maintenance. For instance:

- The preventive maintenance tasks of cleaning coils and replacing dirty filters in a heating, ventilation, and air-conditioning (HVAC) system have shown reduced energy costs for running an HVAC of 8% – 10%.

- In one company that adopted preventive maintenance, equipment breakdowns went from being a common occurrence to constituting approximately 1% of scheduled operating time over a ten-year period.

- Further, maintenance efficiencies allowed the company to reduce its maintenance workforce from 15 to 8 employees during that time.

- In another instance, by training maintenance workers in preventive maintenance, nine community colleges improved the efficiency of HVAC operations and saved an estimated 6 to 19 percent of their total annual energy bills, or $0.09 to $0.26 per square foot per year.

The Public Works Department should expand its building maintenance services to include the following:

- Identify the types of equipment that require preventive maintenance such as electrical systems, heating, ventilating and air conditioning systems, elevators, roofs, plumbing systems, fire protection systems, etc.

- Determine the maintenance activities necessary to maintain building systems.

- Document the tasks that must be performed to preventively maintain these building systems and develop checklists.

- Develop and install a scheduling and performance system for preventive maintenance.

Recommendation: The Public Works Department should expand its building maintenance programs to develop prevention maintenance programs for City facilities.

(3.4) Develop a Formal Work Scheduling System for Building Maintenance and Repair.

The work performed by Building Maintenance is not planned and scheduled on a routine, ongoing basis.

The Public Properties Manager should develop and install a formal work planning and scheduling system. The planning and scheduling system should be developed to accomplish the following:

- Reduce the rate of equipment failures;
- Lower maintenance costs;
- Improve planning and scheduling of work;
- Manage resources to improve productivity;
- Define the minimum requirements for preventive maintenance;
- Provide periodic reports to management.

The steps necessary to establish this planning and scheduling system are portrayed below.

(3.4.1) Develop and Utilize a Work Order for the Performance of Preventive Maintenance and Corrective Repairs.

The Building Maintenance Staff should not perform any work without the assignment of a written work order. At a minimum, the work order should include the following components:

- The building;

- The location;
- The date the request for service was made and the date of completion;
- The equipment on which the preventive maintenance or corrective repairs is to be performed;
- Specific work instructions;
- The cost of the service including the hours of labor, amount of materials and supplies, and other costs such as contractors.

This work order should serve as the basis for all assignments to the Facilities Maintenance staff.

Recommendation: Develop a work order system for Building Maintenance.

Recommendation: The Building Maintenance Staff should not perform any work without the assignment of a written work order.

(3.4.2) Develop a Planning and Scheduling System.

Planning and scheduling define how staff resources will be utilized over a period of time and provides the basis for evaluating actual labor hours versus planned. Also, it is a means for notifying the customer of milestones and completion dates. Scheduling can be divided into three types: master scheduling, weekly scheduling, and daily scheduling.

- Master scheduling is the broadest, longest-range type of scheduling. It looks forward to a horizon that is at least three months. A typical master schedule has the characteristics portrayed below.
  - It has a three to six month horizon.
  - Two schedules would be developed: one for corrective repairs and one for preventive maintenance.
  - Only large jobs or projects are scheduled for the corrective repair schedule. These would typically be anything more than 24 to 32 work hours of labor. No attempt is made to schedule emergency or minor

repairs.

- The time period in the master schedule is typically divided into bi-weekly or monthly schedules.
- All available capacity is not scheduled for corrective repairs. Typically, only 50% of available labor hours should be scheduled. The remainder is reserved for emergencies and preventive maintenance.
- Preventive maintenance should be included in the master schedule, listing the equipment and the type of preventive maintenance to be performed.
- Master schedules are shared with departments.

• Weekly scheduling is fed by the master schedule with jobs that have been anticipated and planned well in advance. The weekly schedule also contains unplanned jobs that arise unexpectedly or result from a shift in priorities. A typical weekly schedule has the characteristics portrayed below.

- While master schedules contain only 50% to 80% capacity, weekly schedules should attempt to contain 80% to 90% of capacity.
- Weekly schedules reflect known leave by employees.
- Jobs are not scheduled until major items of material are available in the warehouse.

• Daily scheduling is the process of converting the weekly schedule into daily assignments through work orders.

The preparation of this scheduling system should be a key responsibility for the Public Properties Manager.

Recommendation: The Public Properties Manager should develop, install, and utilize a work planning and scheduling system.

4. LEASING GUIDELINES NEED TO BE REDEVELOPED TO ENSURE BUILDING LEASES RECOUP BUILDING MAINTENANCE EXPENSES.

The City owns and operates several facilities, which are leased to private organizations, non-profits, etc. The Public Works Department is responsible for maintaining properties for which the lease requires the City to provide building

maintenance services. With that said, the City has not established a formal mechanism through which lease costs are established and / or costs are subsidized by the general fund (e.g., in which circumstances / lease agreements the City is willing to only partially recover its costs). For example, the City leases property to the American Legion. The table, which follows, provides a summary of costs the City does not recover through its lease agreement.

Commodity	Monthly Average	Annual Cost
Heating Oil	$469.61	$5,635.27
Electricity	$852.87	$10,234.47
Natural Gas	$50.52	$606.19
Water	$53.38	$640.58
Sewer	$56.20	$674.34
Service Contract	$73.33	$880.00
Boiler Inspection	$16.67	$200.00
HVAC	$41.67	$500.00
Totals	**$1,614.24**	**$19,370.85**

As shown in the table, the lease costs for the American Legion exclude nearly $20,000 in utility and maintenance costs. The City should establish a formal policy with respect to cost recovery for lease facilities. This should include the following for each lease agreement: (1) market rate comparison for each lease site (e.g., average cost per square footage for facility type, such as warehouse, office space, etc.); (2) historical operational costs (e.g., facility maintenance and utility costs, etc.); and (3) future capital expenditures (e.g., replacement of building assets, upgrade to building systems, etc.). In addition to collecting and reviewing financial data prior to lease agreements, the City of Gloucester should also establish formal guidelines against which cover recovery targets are set (e.g., compatibility with City-wide goals and objectives, etc.).

Recommendation: The City of Gloucester should establish cost recovery goals with respect to lease facilities. The Public Works Department should provide

decision makers with data relating to operational and capital costs for each lease site.

5. THE PUBLIC PROPERTIES DIVISION SHOULD DEVELOP SERVICE LEVEL AND QUALITY STANDARDS FOR THE MAINTENANCE OF PARKS AND OPEN SPACE, AND FIELDS.

The Public Properties Division is responsible for proving parks, open space, beach, and field maintenance for both developed and undeveloped sites throughout the City. The Public Properties Divisions maintains approximately 6,372 acres, including developed parks and beaches, public monuments, cemeteries, beaches, etc. The table, which follows, provides a list of property for which the Division provides maintenance.

Site	Acres
Beaches	
Good Harbor Beach	55.0
Niles Beach	1.0
Pavilion Beach	1.0
Plum Cove Beach	1.0
Lanes Cove	4.0
Magnolia Beach	1.0
Cressy Beach	1.0
Half Moon Beach	1.0
Wingersheek Beach	150.3
Sub-Total Beaches	**215.3**
Developed Acreage	
Ben Smith Playground	0.4
Matto's Field	6.3
Parsons Playgrounds (EG)	2.0
Swinson's Field	7.1
Para Research Field	2.3
Burnham's Field	3.7
Charlie Thomas Field	1.9
Fort Square Playground	0.9
Green St. Field	10.5
Middleton Playground	0.5
GHS Athletic Fields	21.2
The Oval Field	2.7
Lookout Playground	1.1
Ellery House Field	0.5
Brown's Field	1.0
Babson Playground	0.2
O'Maley Grounds / Field	27.0

Site	Acres
Beeman School Field	1.0
Plum Cove Field	2.0
Stage Fort Park	54.0
W. Parish field	6.0
Burkes Field	3.0
Kettle Cove Field	1.5
Magnolia Woods	15.0
Rocky Neck Park	2.1
Gordon Thomas Park	0.6
Fitz Hugh Lane House Grounds	1.7
Solomon Jacobs Park	0.4
Stacey Boulevard	1.0
Little River Landing	0.5
Corliss Landing	0.5
Grant Circle	2.0
Riverdale Monument	0.5
Korean Monument	0.5
Police Station Grounds	0.5
City Hall Grounds	0.5
Sub-Total Developed Acreage	**182.6**
Undeveloped Acreage	
Wing.	3,551.7
Dogtown Commons	2,300.0
Days Pond	1.6
Ten Pound Island	3.5
Salt Marsh Thatcher Road	7.7
Open Space 30 High Popples	15.7
Open Space 17 - 19 Marble Road	1.0
Open Space 45 - 49 Marble Road	20.7
Open Space 102 Mount Pleasant	1.8
Beckford Street	3.8
Ledgemore Avenue	3.2
Marshland - Ashland Place	0.2
Saltmarsh - Off Route 128	7.0
Saltmarsh - 100 Gloucester Avenue	2.4
36 - 38 Altantic Road	0.4
44 Atlantic Road	0.1
112 Atlantic Road	1.4
148 Atlantic Road	2.8
Beachbrook Cemetery	17.1
Seaside Cemetery	10.7
Dolliver Memorial Cemetery	6.0
Cherry Hill	2.9
Langsford Cemetery	0.8
Magnolia Cemetery	1.1
Sumner Street Cemetery	3.6
Clark Cemetery	1.1
Bay View Cemetery	1.2

Site	Acres
First Parish Burial Ground	2.5
Second Parish Burial Ground	0.5
Cove Hill Cemetery	0.5
Bray Cemetery	0.2
Prospect Street Cemetery	0.6
Sub-Total Undeveloped Acreage	**5,973.8**

Of the 6,372 acres, 215 acres are beaches, 183 acres consist of developed parks, and 5,974 acres consist of undeveloped parks or open space (including cemeteries).

The sections, which follow, provide recommendations for the Public Properties Division to improve the management of these properties.

(5.1) The Public Properties Division Should Develop Service Level Standards for the Maintenance of City property.

What should a well-maintained park look like? Most people would prefer a park with lush green turf, healthy and attractive plants, shrubs, flowers, and trees, safe and clean recreational facilities in good condition and an attractive area free from debris and litter. However, while there are standards for the appearance of a park in terms of the condition of vegetation in park facilities, as well as standards on the labor required to achieve this condition, wide latitude is possible on the level of service for different types of parks and facilities. Levels of park maintenance will vary depending on the type of facility, intensity of use, and on local standards. For example, parks that are widely used for a variety of leisure activities generally will require a higher level of maintenance than passive neighborhood parks. This means that different levels of service will prevail throughout the City's park system. Service levels are not fixed levels of maintenance for all facilities, but rather variable levels to be applied to individual facilities.

The Parks and Forestry Division should define the level of service to be provided in the maintenance of its park, landscape, open space, and urban forest system. Important points to note about the alternatives are presented in the points below:

- **Mode A** is state-of-the-art maintenance applied to a high quality, diverse landscape usually associated with City-owned buildings. Mode A facilities have the following characteristics.
  - The turf is lush, dark green in appearance, of high quality and free from weeds, insects, fungus, or any foreign grasses.
  - The turf is cut to a precise level, and groomed weekly during growing season.
  - Plants and trees are pruned, trimmed, and shaped to ornamental beauty and are free from insects or fungus.
  - Planter beds are well raked, cultivated weekly and are free of weeds, grass, or any foreign matter.
  - Irrigation systems are constantly maintained and tested weekly.
  - Litter and/or other debris is removed daily.
  - Reseeding and sodding are done whenever bare spots are present.
- **Mode B** is a high level of maintenance associated with well-developed park areas with reasonably high visitation. Mode B level of service is similar to Mode A level of service, with a major difference being the degree of plant and turf grooming. The turf has a lush green appearance and is free from weeds and foreign grasses. Precise cutting and mowing, however, is not practiced. Plants and trees are trimmed, pruned, and shaped to ornamental beauty, but not with the same frequency. Planter beds are free from weeds, debris, or grasses, but flowerbeds are not as extensive.
- **Mode C** is a moderate level of maintenance associated with locations of moderate to low levels of development and moderate to low levels of visitation. Mode C facilities have the following characteristics.
  - Turf management such as mowing, reseeding and sodding, weed control and fertilization are practiced to ensure lush, green and healthy grass. However, it is applied less frequently than higher maintenance levels since

turf area is generally not used for a variety of organized sports and leisure activities (e.g., soccer).

– Weeds and mixed grasses are tolerated in the turf, but do not become major problems since turf conditioning is practiced on a scheduled basis.

– Turf edging is performed monthly, conducive to a generally neat appearance most of the time.

– Litter and/or other debris is removed weekly or bi-weekly.

– Plants and trees are trimmed and pruned annually to ensure proper growth and a generally attractive appearance.

– Planter bed areas are weeded and cultivated at four-month intervals, so wild weeds or grasses may be present for short periods of time prior to scheduled maintenance. They are tolerated at this level as long as they are small in size and the area covered is minimal.

- **Mode D** level of service is for areas in which maintenance is reduced to a minimum. Such areas do not have developed turf or irrigation systems. These areas are maintained only to the extent necessary to control growth to reduce fire hazards, and keep native vegetation alive and healthy during the growing season and to eliminate unsafe facilities. However, open space will need variations in the level of service defined based upon the type of open space (e.g., farmland versus open space that is actively maintained).

The text below suggests how City grounds should be allocated by the mode or level of service.

- City owned and operated buildings would be the only facilities allocated to Mode A. However, segments of other facilities could also be allocated to this mode.

- Facilities with high visitation and usage would be allocated to Mode B.

- The bulk of neighborhood parks would be allocated to Mode C. These represent parks that are developed, but receive moderate to low levels of visitation.

- Those facilities which are largely natural are allocated to Mode D.

The City should adopt formal condition and maintenance standards appropriate for each of its parks.

Possible levels of service for parks are presented on the table, which follows.

ALTERNATIVE LEVELS OF SERVICE				
Task	**Mode A**	**Mode B**	**Mode C**	**Mode D**
1. **Turf Care**				
Mowing	Weekly	Weekly	Weekly	Demand
Aeration	3 Mo. Inter.	6 Mo. Inter.	Annually	N/A
Vacuuming	3 Mo. Inter.	6 Mo. Inter.	Annually	N/A
Fertilization	6 Wk. Inter.	3 Mo. Inter.	Annually	N/A
Edging	Weekly	Monthly	Monthly	N/A
Sprinklers - Test	Weekly	Monthly	Monthly	N/A
Weed Control	Constant	Monthly	Demand	Demand
2. **Litter Control**	Daily	Daily	Daily	Weekly
3. **Pruning**				
Trees	6 Mo. Inter.	Annually	Annually	Annually
Shrubs	6 Mo. Inter.	Annually	Annually	Annually
4. **Floral Plantings**	At least two blooming cycles a year.	Perennials or flowering trees or shrubs only.	Perennials or flowering trees or shrubs only.	None. Maybe plantings or wildflowers at special locations.
5. **Restrooms**				
Cleaned	Daily	Daily	Daily	N/A
6. **Disease and Insect Control**	Constant	Constant	Demand	Demand
7. **Play Equipment**				
Paint & Overhaul	N/A	Annually	Annually	N/A
Inspect	N/A	Weekly	Weekly	N/A
8. **Picnic Tables**				
Stain & Refinish	N/A	Annually	Annually	N/A
9. **Athletic Facilities**				
Re-line tennis/basketball courts	N/A	Annually	Annually	N/A
Line athletic fields	N/A	4 Mo. Inter.	6 Mo. Inter.	N/A
Edge turf of ball diamonds	N/A	Bi-weekly	Demand	N/A
Drag infields	N/A	Daily	Daily	N/A
Level infields	N/A	4 Mo. Inter.	Annually	N/A
10. **Trash Receptacles**				
Empty Receptacles	Daily	Weekly	Weekly	N/A
11. Sweep Walkways				
Sweep walkways	Daily	Weekly	Weekly	N/A
12. **Groundcover/Shrub Areas**				
Weeding	Monthly	Quarterly	Quarterly	Semi-Annually
Edging	Monthly	Quarterly	Quarterly	Semi-Annually
Pruning	Quarterly	Semi-Annually	Semi-Annually	Annually
Litter Control	Daily	Daily	Daily	Daily

Recommendation: The Public Properties Division should develop formal service level standards for the parks and grounds that it maintains. A specific level of service should be designated for each site.

(5.2) The Public Properties Division Should Develop Formal Quality Standards for the Maintenance of the City's Parks.

Quality standards are designed to express the results expected in the maintenance of the City's park system. The standards are stated as "end products" (e.g., turf to be mowed to a height of two inches). This standard is intended to generate a consistent level of service and quality in all of the facilities. Possible quality standards for parks are presented in the table below.

SAMPLE QUALITY STANDARDS FOR MAINTENANCE OF CITY PARKS	
Mowing	Turf area to be mowed weekly during the growing season – grass height 2".
Trimming & Edging	All driveways, sidewalks and edging strips shall be edged every two weeks during the "on" season. Grass and weeds around trees, tree wells, header boards, fences, backstops, etc., shall be trimmed monthly or more frequently to maintain appearance. In no case shall grass or weeds exceed 6". Grass clippings and trimmings in walks shall be swept or blown off walks and removed if required.
Fertilization	Fertilization of the turf area should be completed with a balanced fertilizer such as 16-6-8 annually once during the summer. Turf should be tested if the recommended fertilizer does not produce desired results.
Insecticides, Herbicides, Pre-Emergents, Insect Control, Disease Control, and Rodent Control	A seasonal spray chart will be developed and maintained in the Parks and Forestry Division. Herbicides and pre-emergents shall be applied according to the approved spray program year-round, weather permitting, with the primary objective being the prevention of weed growth.
Aeration	Turf aeration should be completed during the spring while the grounds are still soft from winter moisture.
Irrigation System	The irrigation system should be set to apply enough water to wet the soil to a depth of 4" to 6". The automatic timing system should be set to avoid interference with sports and other uses. Automatic controllers and sprinkler systems should be checked at least once a week for any abnormalities; failure to do so could result in loss of turf area, the waste of water or the interference with usage.
Litter Control	Park areas shall be maintained constantly and kept in a litter-free condition. Trash pick-up shall be on a regular and frequent schedule to prevent over-accumulation of trash and development of unsanitary conditions. Trash pick-up schedules shall be developed to meet the changing conditions of park usage.

SAMPLE QUALITY STANDARDS FOR MAINTENANCE OF CITY PARKS	
General Site Inspection	The Parks and Forestry Division staff shall inspect the areas in which they are assigned to work on a daily basis, and report any hazards or correct them immediately. All acts of vandalism shall be reported at once and a report written.
Play Area	Swings and play equipment shall be inspected on a weekly basis and serviced if required.
Tennis Courts	Shall be blown weekly to clear dirt and other debris from surface. Surface should be washed weekly, if possible. Nets should be inspected and adjusted weekly.

Recommendation: The Public Properties Division should develop quality standards for the maintenance of City parks.

(5.3) Expand the Annual Work Program to Provide More Detail and Aid in the Management of Division Resources.

The Public Properties Division has developed a general annual work plan that presents, by month, the general types of services provided or required (e.g., mowing, rubbish removal, etc.). With that said, the Public Properties Division should expand its annual work program so that it may serve as the broad framework for a detailed maintenance plan. An annual work plan should designate the approximate months in which maintenance operations will be performed, and serves as a reference in planning the seasonal work program insuring the scheduling and accomplishment of work. The development of an annual work program takes into consideration two major questions:

- What amount of work is needed to provide the desired levels of service to the public? This would include defining the types of work necessary to accomplish the goals and objectives of the Public Properties Division. For example, for open space maintenance this would include such work activities as weed abatement, mowing, herbicide spraying, etc.

- What required levels of staff, equipment, and materials will be needed to provide that level of service and at what cost? This will begin with defining the frequency with which work activities are performed annually (e.g., weed abatement of open space is performed twice annually); the crew size required to perform the work activities (e.g., weed abatement of open space requires a two person crew); the equipment and materials required to perform the task; the number of crew days

and staff days required to perform each work activity during the fiscal year; and the total cost for each work activity.

In essence, the annual work program applies activity-based costing to maintenance of parks and open space. An annual work program needs to be developed within an automated maintenance system that will not only guide the Public Properties Division in prioritizing and performing specific tasks, but will provide the Public Properties Manager and the Department Director with a document to hold staff accountable for results. This should be developed in the Public Properties Division as other divisions develop their annual work plans and the Department implements a computerized maintenance management program.

Recommendation: The Public Properties Division should expand its annual work plan to provide a greater level of detail, including staff and equipment resources required and level, quality and frequency of service seasonally.

(5.4) The Public Properties Division Should Conduct Park and Grounds Condition Assessments.

A facility condition inspection function is necessary for planning cost-effective preventive and corrective maintenance. Scheduled visual inspection of all components of parks and landscaped areas provides data that can be used for assigning priorities and estimating costs for maintenance, and evaluating the performance of the staff of the Public Properties Division. Such a program ensures that unmet maintenance needs are documented and provides data for setting priorities and evaluating the performance of maintenance activities.

Work orders should be issued to correct problems identified during the assessment of parks. This should be done on a formal basis through the issuance of the work orders and by producing a monthly report identifying maintenance and quality

problems as well as the resolution and status. The monthly report should include the problem, the location of the problem, the date the work order was issued to correct the problem, the resolution or current status of the problem, and any necessary follow-up.

The maintenance management system is perhaps the most critical component of asset management. Essentially, it establishes a timetable and a schedule for what is to be accomplished by specific crews on a specific day at a specific location and reporting actual results versus this timetable and schedule.

Recommendation: The Public Properties Division should conduct condition assessments of parks and landscaped areas every six months and follow up with work orders to correct any identified issues or deficiencies.

6. A NUMBER OF STAFFING ADJUSTMENTS SHOULD BE MADE FOR THE MAINTENANCE OF PARKS, FIELDS, AND CEMETERIES.

This section provides an analysis of the workload and staffing of the primary service areas of the Public Properties Division. The information utilized in this section was obtained from available records and statistical reports.

(6.1) The Level of Staffing for Park and Field and Field Maintenance Is Insufficient, and Six Seasonal Positions Should Be Authorized for the Time Period Between Memorial Day and Labor Day.

The Public Properties Division is responsible for the maintenance of parks and fields. The staffing allocated to the maintenance of parks and fields are presented in the table below.

Grounds Maintenance	Parks Maintenance Man Construction Handyman Special Motor Equipment Operator Seasonal	1 1 1 3	• Responsible for mowing and trimming of City grounds and right-of-way (10 to 12 monuments and City buildings). • Responsible for refuse collection.

Field Maintenance	Park Maintenance Craftsman Parks Maintenance Man Seasonal	1 2 2	• Responsible for mowing and trimming of athletic fields for both the City and school system. • Responsible for painting and striping of athletic fields.

In analyzing the workload and the staffing for park and field maintenance, the Matrix Consulting Group developed a number of findings and conclusions.

- **Maintenance of a "B" level of service requires approximately one full-time equivalent maintenance staff for every six to ten acres of developed parks**. The broad industry guidelines that the Matrix Consulting Group has evaluated relate the ratio of park maintenance workers to acres under maintenance for various service levels ranging from "A" to "C". The table that follows provides the standard definition for each of these service levels.

Service Level	Service Level Definition and Required Maintenance Staffing
"A"	State-of-the-art maintenance applied to a high quality, diverse landscape. Turf is lush, dark green, free from weeds and cut to a precise level. Plants and trees in parks are pruned, trimmed and shaped to ornamental beauty. Requires one park maintenance worker per 4 to 6 developed park acres.
"B"	A high level of maintenance associated with well-developed park areas with reasonably high visitation. Major difference with Service Level "A" is turf is not cut to precise level and plants and trees in parks are not pruned and trimmed at the same frequency. Requires one park maintenance worker per 6 to 10 developed park acres
"C"	A moderate level of maintenance associated with locations of moderate to low levels of development and visitation. Requires one park maintenance worker per 10 to 15 developed park acres.

- **The Public Properties Division relies extensively on seasonal employees with a ratio of one full-time employee to one and two-thirds seasonal employees**. Given the seasonal workload, this is to be expected. It also reflects a cost-effective maintenance management practice by the Public Properties Division.

- **There are a total of 182.6 acres of neighborhood parks, regional parks, mini-parks, fields, and traffic islands maintained by the Public Properties Division.** The Division allocates six full-time maintenance staff and five seasonal staff to the maintenance of these facilities (this excludes cemeteries).

- **For the growing season, the level of full-time and seasonal staffing is insufficient to maintain the neighborhood parks, regional parks, mini-parks, and traffic islands.** The ratio of acreage (excluding cemeteries) to full and seasonal staff amounts to fifteen acres per maintenance staff. This is insufficient to enable the Division to deliver a "B" level of service.

- **The number of seasonal employees should be increased by six positions.** The Public Properties Division would require the addition of six seasonal positions to redress the level of staffing and bring it within a reasonable range required to maintain the City's parks and fields. Two of these six seasonal positions should be reallocated from maintenance of cemeteries as noted in the next section. This would result in a ratio of three (3) full-time positions to fifteen (15) seasonal positions. This is a significant reliance of seasonal positions.

- **Over the longer-term, the mix of full-time and seasonal employees utilized for grounds and field maintenance should be adjusted**. Given the seasonality of growing seasons in Massachusetts, the project team would recommend that the City reduce, through attrition, the number of full-time staff by two positions, and reallocate funding to seasonal labor. To mitigate the problems associated with the use of seasonal staff, the City should increase the hourly wage to attract a higher level of talent.

The staffing for the Public Properties Division for the maintenance of parks and fields is inadequate given the workload. The cost impact of the addition of these six seasonal positions is presented in the table below.

Annual Cost Increase		Annual Cost Decrease	
Authorize four additional seasonal employees for the maintenance of parks and fields between Memorial Day and Labor Day.	$25,600	Reduce, through attrition, the number of full-time staff allocated to grounds and field maintenance by two full-time positions.	$101,200
Increase the amount of seasonal labor to replace two positions allocated to grounds and field maintenance.	$40,000		

Recommendation: Authorize an additional five seasonal positions between Memorial Day and Labor Day for the maintenance of parks and fields.

Recommendation: Over the longer-term, the mix of full-time and seasonal employees utilized for grounds and field maintenance should be adjusted. The City should reduce, through attrition, the number of full-time staff by two positions, and reallocate funding to seasonal labor.

(6.2) The Public Properties Division Should Use Contract Maintenance for Its Smaller Park Facilities.

There are a number of trade-offs between contract and in-house maintenance. The advantages of contractual park maintenance include the following:

- With in-house staff, labor is a fixed cost which cannot be reduced unless the number of staff are reduced. Contractual costs, on the other hand, can be varied by adjusting service levels.

- Contractual maintenance costs substantially less. In a review of ten agencies that contracted for park and landscape maintenance, the reduction in cost ranged from 15% to 39% in comparison to in-house costs. This excludes the cost of utilities and the repair of vandalism and the repair of the irrigation systems.

There are disadvantages to contracting, however. These include the following:

- If the performance of a task is not in a contract, it will cost extra to perform. Realistically, it is not possible to anticipate every task that needs to be performed (e.g., emergencies).

- Contracts still need to be supervised to assure compliance with the contract.

- Low bids by unqualified contractors can potentially present a problem. It is important to develop good specifications that will screen the unqualified contractors through the use of requirements for liability insurance, the performance of similar contracts for other agencies, etc.

- Lack of sensitivity to the public is another potential problem. The specifications should require standards of conduct as well as uniforms.

However, with effective contract management and the retention of an in-house maintenance capacity to monitor the contract, the project team recommends that the Public Properties Division utilize contractors for the maintenance of smaller parks. It is recommended that the in-house staff concentrate on maintaining the larger, high-priority park facilities and expand private contracts for maintaining fragmented smaller, and lower priority facilities. These facilities would include, initially, the following:

Babson Playground	0.2
Ben Smith Playground	0.4
Solomon Jacobs Park	0.4
Middleton Playground	0.5
Ellery House Field	0.5
Little River Landing	0.5
Corliss Landing	0.5
Riverdale Monument	0.5
Korean Monument	0.5
Police Station Grounds	0.5
City Hall Grounds	0.5
Gordon Thomas Park	0.6
Fort Square Playground	0.9
Brown's Field	1
Beeman School Field	1
Stacey Boulevard	1

This would result in contracting for the maintenance of all of the parks with less than one acre. The cost for the contracting of these facilities should be offset with reductions in seasonal labor costs.

Recommendation: Contracting for park maintenance should be utilized to include all of the mini-parks, building grounds, and fields less than one acre.

(6.2) The Level of Staffing for the Maintenance of Cemeteries Is More Than Adequate.

The Public Properties Division is responsible for the maintenance of three cemeteries. These three cemeteries include Beachbrook (17.1 acres), Seaside (10.1 acres) and Cherry Hill (2.9 acres). The roles of the staff allocated to the maintenance of cemeteries are presented in the table below.

Cemeteries	Cemetery Maintenance Craftsman Seasonal	1 5	• Provides general maintenance and upkeep of 3 City cemeteries (Beach Brook, Seaside, and Cherry Hill). • Responsible for grass, trimming, and brush trimming. • Also responsible for setting gravestones and markers.

In analyzing the workload and the staffing for cemetery maintenance, the Matrix Consulting Group developed a number of findings and conclusions.

- **Maintenance of a "C" level of service requires approximately one full-time equivalent maintenance staff for every fifteen acres of cemeteries**. The broad industry guidelines that the Matrix Consulting Group has evaluated relate the ratio of park maintenance workers to acres under maintenance for various service levels ranging from "A" to "C". The table that follows provides the standard definition for each of these service levels.

Service Level	Service Level Definition and Required Maintenance Staffing
"A"	State-of-the-art maintenance applied to a high quality, diverse landscape. Turf is lush, dark green, free from weeds and cut to a precise level. Plants and trees in parks are pruned, trimmed and shaped to ornamental beauty. Requires one park maintenance worker per 4 to 6 developed park acres.
"B"	A high level of maintenance associated with well-developed park areas with reasonably high visitation. Major difference with Service Level "A" is turf is not cut to precise level and plants and trees in parks are not pruned and trimmed at the same frequency. Requires one park maintenance worker per 6 to 10 developed park acres
"C"	A moderate level of maintenance associated with locations of moderate to low levels of development and visitation. Requires one park maintenance worker per 10 to 15 developed park acres.

- **Cemeteries Should Be Maintained at a "C" Level of Service**. This would be a moderate level of maintenance associated with locations of moderate to low levels of development and visitation. Cemeteries would require one maintenance worker per 10 to 15 developed park acres.

- **The Public Properties Division relies extensively on seasonal employees with a ratio of one full-time employee to five seasonal employees**. Given the seasonal workload, this is to be expected. It also reflects a cost-effective maintenance management practice by the Public Properties Division.

- **There are a total of 30.1 acres of cemeteries maintained by the Public Properties Division.** The Division allocates one full-time maintenance staff and five seasonal staff to the maintenance of these facilities. It should be recognized that some cemeteries are maintained by volunteers at present and that this program may not prove effective.

- **For the growing season, the level of full-time and seasonal staffing is more than sufficient to maintain the cemeteries.** The ratio of acreage (excluding

cemeteries) to full and seasonal staff amounts to five acres per maintenance staff. This is sufficient to enable the Division to deliver an "A" level of service.

- **The number of seasonal employees should be decreased by two positions.** The Public Properties Division should reallocate two seasonal positions from maintenance of cemeteries to the maintenance of parks and fields.

The staffing for the Public Properties Division for the maintenance of cemeteries is more than adequate given the workload.

Recommendation: Reallocate two seasonal positions from the maintenance of cemeteries to the maintenance of grounds and fields. This recommendation should be evaluated in the context of the effectiveness of the use of volunteers for the maintenance of cemeteries.

7. RESPONSIBILITY FOR OPERATION OF THE LIFEGUARD PROGRAM FOR THE CITY'S BEACHES SHOULD BE REALLOCATED TO THE RECREATION DEPARTMENT.

The Public Properties Division is not only responsible for the maintenance of the City's beaches, but also for the City's lifeguard program. The staffing allocated to this program is presented in the table below.

Public Infrastructure Division/Beach Operations	Maintenance Worker (Seasonal) Lifeguards (Seasonal) Office Aide (Seasonal)	12 30 1	• Responsible the maintenance of City-owned beaches. • Provide beach raking, trash removal, and maintenance of beach facilities (e.g., restrooms, concessions, etc.). • Responsible for staffing public-owned parking lots, including collecting fees, monitoring lots and assisting with parking of vehicles. • Lifeguards are responsible for monitoring beaches and waterways to ensure safety of customers. • Office Aide provides administrative and clerical support during peak seasons. This includes receipt and processing of public request for services, complaints, etc. • Staff are seasonal and typically work from April through August.

It is unusual for a Public Works Department to manage a lifeguard program for pools or for beaches. These programs are typically managed by a Recreation

Department as part of the organized recreation services provided by these departments, such as swim lessons. This responsibility in Gloucester should be reallocated to the Recreation Department. The responsibility of the Public Works Department should be limited to the maintenance of the beaches including beach raking, trash removal, and maintenance of beach facilities (e.g., restrooms, concessions, etc.).

Recommendation: The Recreation Department should be assigned responsibility for management of the City's lifeguard program, including the budget for these positions and the recruitment and selection of lifeguards.

Recommendation: The thirty seasonal lifeguard positions should be reallocated to the Recreation Department.

Recommendation: The seasonal Office Aide position responsible for providing administrative and clerical support during peak seasons should be reallocated to the Recreation Department. This includes responsibility for the receipt and processing of public request for services, complaints, etc.

Recommendation: Those seasonal maintenance workers allocated to the staffing public-owned parking lots, including collecting fees, monitoring lots and assisting with parking of vehicles, should be reallocated to the Recreation Department.

10. ANALYSIS OF CENTRAL SERVICES

10. ANALYSIS OF CENTRAL SERVICES DIVISION

The Central Services Division of the Public Works Department oversees the functions related to the business services office, central stores, vehicle maintenance, water meters and solid waste recycling. The Division is assigned sixteen (16) full-time equivalent positions along with two (2) part-time custodial staff. This chapter of the report analyzes these functions in more detail.

1. FLEET SERVICES HAS ADEQUATE STAFFING FOR THE MAINTENANCE AND REPAIR OF THE MUNICIPAL FLEET.

The Fleet Services Unit is responsible for the maintenance and repair of the Department's fleet, as well as providing maintenance and repair for other municipal Departments. The points, below, provide a description of the Fleet Services Unit.

- There are 3.0 FTEs assigned to the Fleet Services Unit, including (1) Working Foreman, (1) Mechanic and (1) Maintenance Man.
- This Unit is responsible for providing fleet maintenance and repair services for the Department of Public Works, Police Department, School Maintenance, and the Harbor Master.
- This Unit coordinates the preventive maintenance and unscheduled repair of the municipal fleet.
- This Unit is also responsible for coordinating repair and maintenance services provided by outside agencies (e.g., vendors providing service under warranty, auto body shops, etc.).

In order to assess the capacity of the Fleet Services Unit to maintain and repair DPW vehicles and other equipment, staffing levels were analyzed using vehicle equivalency units (VEU). The principle of vehicle equivalent units expresses each piece of equipment in terms of its equivalent or counterpart expressed in a common unit of measure, in this case a standard fleet sedan, which is given a baseline VEU value of

1.0. All other types of equipment are assigned a VEU value in terms of their relationship to a standard fleet sedan. For example, a forklift would be given a rating of 0.25 VEU, meaning that it would require one-quarter the effort to maintain as a standard automobile. Conversely, a complex and maintenance-intensive piece of equipment, such as a fire engine, would require the same effort to maintain as 8 standard sedans. By aggregating all of the vehicles in a fleet in terms of their vehicle equivalent units, uniform standards and benchmarks can be applied regardless of the fleet's size, type, or configuration.

When the maintenance and repair workload was calculated using vehicle equivalency units, the total VEU's amounts to 330.0. This is a snapshot of the City's fleet as it exists at the present time. As noted, there are three staff responsible for maintaining the Department Public Works' fleet. The amount of workload one mechanic should be capable of handling ranges from 90 to 120 units depending on the age and condition of the fleet. However, two of these three positions are skilled, and one is semi-skilled. The amount of workload necessary for the maintenance and repair of the City's fleet requires three skilled positions.

The annual cost impact of upgrading the Motor Equipment Maintenance Man position to Mechanic is presented in the table below.

Annual Cost Increase		Annual Cost Decrease	
Upgrade the Maintenance Man position to Mechanic through attrition	$17,500	N / A	$0

Recommendation: The number of staff authorized for Fleet Services is sufficient.

Recommendation: The semi-skilled Maintenance Man position should be upgraded to Mechanic through attrition.

2. A PERSONAL COMPUTER SHOULD BE ACQUIRED FOR FLEET SERVICES TO ENABLE THE UTILIZATION OF A FLEET MAINTENANCE MANAGEMENT SYSTEM.

Prior to this study, Fleet Services had a fleet maintenance management system to plan, schedule and track workload for the City's municipal fleet. Fleet Services Unit lost its computer and database as a result of a fire.

The project team recommends the acquisition of a personal computer for the Fleet Services to enable this Section to continue utilization of its fleet maintenance management system.

Recommendation: The Fleet Services Unit should acquire a desktop for the utilization of its fleet maintenance management system. Data on this system should be backed up.

3. ANALYSIS OF THE AGE OF THE CITY'S FLEET INDICATES A NEED TO DEVELOP APPROPRIATE REPLACEMENT GUIDELINES.

The City does not have a formal structure replacement program for the municipal fleet. A review of the age and utilization of the fleet illustrates this point. The table, which follows, presents the average mileage for the fleet.

Fleet Utilization	Mileage
Average	60,634
Median	59,752
Quartile	
1st	25,557
2nd	59,752
3rd	80,860
4th	164,963

As shown in the above table, the average number of mileage per vehicle is approximately 60,600 miles. The table, below, presents the age of the municipal fleet.

Fleet Utilization	Age
Average	11
Median	10
Quartile	
1st	6
2nd	10
3rd	13
4th	39

As the table shows, approximately one-half of the municipal fleet is 10 years old or younger. Conversely, approximately one-half of the City's fleet is more than ten years old.

The Central Services Division should develop a five-year replacement plan for consideration of the Public Works Director and the Finance Director that identifies the units proposed for replacement over the next five fiscal years by unit number.

In the development of this five-year replacement plan, the Central Services Division should then identify units which (1) may be safely eliminated from the fleet without serious operating consequences based upon their levels of utilization, and (2) those units that pose a safety concern, and/or which are exhibiting unusually high costs of operation.

In addition, the Central Services Division should develop a formal replacement policy for the City's fleet.

Recommendation: The Central Services Division should develop a formal replacement policy for the City's fleet. This should be adopted by the City Council and provided for review and approval by the Department Director, Finance Director and the City Council.

Recommendation: The Central Services Division should develop a five-year replacement plan for consideration of the Public Works Director and the Finance Director that identifies the units proposed for replacement over the next five fiscal years by unit number.

4. THE CITY SHOULD ESTABLISH A FLEET REPLACEMENT FUND.

The current method of funding vehicle replacements (pay-as-you-go) can be extremely costly to the City, both currently and in the longer-term, in terms of operating and maintenance costs, the staffing required to provide the service, and problems with consistent delivery of services due to equipment breakdowns.

The City should establish a vehicle fleet replacement fund. There are basically two elements to the establishment of replacement charges associated with this fund:

- Determining the optimum replacement cycle for a given unit or category of units; and
- Identifying the replacement cost for the vehicle.

The first of these two elements, the determination of the optimum replacement cycle for a category of units, can be a complex and highly accurate calculation if the City had available an adequate cost history for vehicle maintenance and repairs. This is not currently the case in the City of Gloucester, however. Many municipalities do not have accurate cost histories, and therefore utilize standardized replacement cycles for various categories of equipment. The Central Services Division will need to utilize other resources, such as those from the National Association of Fleet Administrators, to develop these replacement guidelines.

The second element is establishing the replacement cost of the vehicle. The Central Services Division can utilize data from other fleets and the bid prices of the State of Massachusetts.

The establishment of a replacement fund not only ensures that sufficient funding is available for each unit's replacement, but it also eliminates the wide variations in

vehicle replacement funding from year to year. Further, this method of funding forces user departments to continuously evaluate their respective needs for vehicles, as the monthly contribution to the fund comes directly from their capital budgets.

Recommendation: The City should establish a fleet replacement fund.

5. FLEET SERVICES SHOULD BE ESTABLISHED AS AN INTERNAL SERVICE FUND.

Fleet Services does not currently charge departments for the fleet maintenance and repair services that it provides to these departments with the exception of parts. The most significant cost, labor, is budgeted in the Public Works Department and not allocated as a cost to user departments.

This method has a number of drawbacks.

- It does not reflect the cost of providing services for user departments. If the City wishes to begin utilizing activity based costing, it is important that all costs, including fleet maintenance and repair, be allocated to these activities.
- For some departments, such as water and wastewater, that are funded by revenues other than the general fund, it can result in the general fund subsidizing these services.
- The current method does not hold these departments accountable for the services they utilize, as the costs are reflected only in the Public Works Departmental budget.

Well-managed fleets have established internal service funds, billing user departments for the services they consume. The labor rate charged is a product of the direct hourly compensation rates (plus benefits) of mechanics and helpers, including indirect costs of division management and administration.

In addition, Fleet Services should charge out parts at cost plus an indirect rate to capture the cost of ordering, stocking, monitoring and dissemination of the parts. These

parts should be directly charged to the vehicle receiving the part. The charges should include the pro rata share of the managerial and administrative salaries and benefits of the Central Services Division. Typically, this rate will be in the range of 10% to 15% of the total direct cost of parts.

The establishment of Fleet Services as an internal service fund, with the objective of breaking even at the end of the year applies a standard of business discipline on both the Fleet Services (in the management of costs and the maintenance of high productivity rates for all mechanics) as well as operating departments (in the more judicious consumption of services and the proper preventive maintenance of units to minimize emergency repair costs over time).

The implementation and use of the Fleet Services automated fleet management system will assist the Unit in establishing an internal services fund and charging back the cost of its operations. This should also include fuel consumption.

Recommendation: The Fleet Services Unit should be established as an internal service fund.

6. THE CENTRAL STORES UNIT SHOULD IMPROVE THE MANAGEMENT OF ITS INVENTORY AND REDUCE THE EXTENT OF INVENTORY.

While the Central Stores Unit does not maintain information with respect to the current value of the Department's inventory, inventory turnover, distribution of inventory by Division (e.g., to charge back to the enterprise funds and / or internal services funds, like Fleet), the Matrix Consulting Group identified several opportunities for improvement that would enable the Unit to tighten controls over the Central Stores inventory.

- **Restrict access to the storeroom and the Unit's inventory.** Currently, the Central Stores Unit does not have the ability to restrict access to the supply

room. There are at least 8 people with known access to the storeroom in the Department, as well as possibility of an unknown number of people with access.

- **Conduct periodic audits.** Currently the Central Stores Unit conducts random sampling of items to determine ordering needs. With that said, the Central Stores Unit does conduct periodic inventory audits to determine the extent to which the inventory system and the actual inventory match.

- **Review inventory turnover and reduce the extent and value of inventory.** While the Central Stores Unit does not track inventory turnover, the Unit has several Excel spreadsheets which track total number of units in the inventory as well as total number issued. The Department estimates that the inventory value is approximately $1 million. Given the Department's budget of $15.1 million, this equates to nearly 7% of the Department's operating budget. This is higher than typically found in comparable agencies. The table, which follows, presents an estimate of the Department's turnover and the value of the un-issued inventory.

	Number
Total Number of Units	15,553
Total Number of Units Issued (Sample)	5,604
Total Number of Units Issued (Annualized)	7,472
Inventory Turnover Estimate	**0.48**
Estimated Value of Un-issued Inventory	**$480,437**

As shown in the above table, the project team estimates an inventory turnover of 0.48. This is well below the benchmark. The project team recommends at a minimum an average inventory turnover of 4.0. The Central Stores Unit should reduce the value of in-stock inventory.

Recommendation: The Central Stores Unit should restrict access to the Central Stores Room and implement tighter controls over the physical site.

Recommendation: The Central Stores Unit should conduct periodic audits of inventory to provide better controls over the inventory.

Recommendation: The Central Stores Unit should reduce the amount of inventory in its stockroom and stock those items with high turnover.

Recommendation: Central Stores should track inventory turnover and the dollar value of the inventory.

Recommendation: The Finance Department should conduct an annual internal control audit of Central Stores.

7. THE CENTRAL STORES STOREKEEPER SHOULD ASSIST THE FLEET SERVICES UNIT WITH TRACKING WORK ORDERS ONCE THE FLEET MANAGEMENT SYSTEM IS IN PLACE.

The Central Stores Unit is staffed with one fulltime equivalent responsible for the following:

Storekeeper	1	• Responsible for overseeing the Public Works Department central stores department. • Responsible for ordering and maintaining inventory levels for departmental supplies and parts. • Does periodic inventory checks of stock inventory levels. • Maintains and monitors Gas Boy Fuel System for City. • Provides accounting records for inventory issues by department.

The Storekeeper is responsible for managing the Department's inventory, including ordering, issuing and tracking. Given that the bulk of activity occurs at the beginning of the workday and sporadically throughout the day, the roles and responsibilities of the Central Stores Clerk can be expanded to ensure greater utilization of this position. This position should work with the Fleet Services Unit and provide support with respect to the computerized fleet management program. This should include input of data, maintenance and upkeep of records, etc.

Recommendation: The Storekeeper should assist the Fleet Services Unit with tracking worker orders once the fleet management system is in place.

8. THE DIVISION SHOULD ELIMINATE A METER READER POSITION ONCE THE DEPARTMENT HAS FULLY CONVERTED ITS WATER METERS TO RADIO READS.

There are two Meter Readers assigned to the Central Services Division who are responsible for reading meters, as well as providing in-field service request support (e.g., leaking meters, water shut offs, etc.). The Department is in the process of converting meters to radio reads. Of the 10,954 water meters, approximately 10,206 (or

93%) have been converted to radio reads. Once this program is fully implemented, it will take approximately two staff days to read the entire City and another two for re-reads.

The City's return on its investment should be a reduction in meter reading staffing, by one position. In addition, once fully implemented, the remaining meter reader position should be transferred to the Water Division and utilized for a broader range of duties. The meter reading workload will only require 20% of the available workdays for this position.

The table, which follows, presents a summary of the net fiscal impact.

Annual Cost Increase		Annual Cost Decrease	
N / A	$0	Eliminate a Meter Reader position	$50,600

Recommendation: The Division should eliminate a Meter Reader position once the Department has fully (and successfully) converted the City to radio read meters.

9. THE CITY'S CUSTODIAL SERVICES SHOULD BE OUTSOURCED.

The Matrix Consulting Group reviewed the custodial services provided by the Central Services Division. The points, which follow, provide a summary.

- There are four custodians who work 40 hours per week and an additional two custodians who each work 19 hours per week.
- Custodial services are provided to the following facilities:

Facility	Total Square Feet
City Hall	34,636
CATA Annex	10,560
Public Works	6,000
Police	29,179
Senior Center	10,736
Veteran's Center	5,212
Library	28,097
Total	**124,420**

The Matrix Consulting Group analysis of the staffing requirements and costs for custodial services is presented in the paragraphs below.

- The project team utilizes a benchmark of 1 custodian per 20,000 square feet. As noted above, the Department provides custodial services for nearly 125,000 square feet. This results in an estimated need of 6.22 FTEs. The Department currently has 4.97 custodians. This is a difference of 1.25 FTEs.

- The project team also examined the cost of providing custodial services. Given the existing compensation for custodial staff and the number of custodial staff required (e.g., 6.22 FTES), the project team estimated the personnel services cost to be the following:

	Average Cost per Hour	Annual Hours	No. of FTEs	Total Salary Costs	Benefits at 35%	Total Compensation
Full Time	$19.76	2,080	5.0	$205,504	$71,926	**$277,430**
Part-Time	$15.64	2,080	1.22	$39,688		**$39,688**
Total Salary Costs						**$317,118**

The personnel services cost assumes: (1) utilization of existing 4.0 fulltime custodians; (2) utilization of existing 0.97 part-time custodians; (3) addition of 1.0 fulltime custodian and 0.22 part-time custodians. This equals a total of 6.22 FTEs of custodial staff.

- The project team assumed a supplies and material cost of 5% or approximately $15,900.

The table, which follows, provides a summary of the cost for the in-house provision of custodial services.

Total Custodial Services	$332,974
Total Square Feet of Custodial Services	$124,420
Cost per Square Foot	$2.68

The International City Managers Association (ICMA) conducts a national comparative performance measurement survey of municipalities. The table, which follows, provides the median custodial services costs per square foot, as well as the cost comparison for the City of Gloucester for both in-house and contractual services.

	In-House	Contractual
Administrative	$1.54	$0.90
Library / Cultural	$1.01	$1.13
Recreation / Community Centers	$3.09	$1.04
City of Gloucester	$2.68	

As shown in the above table, the cost per square foot in the City of Gloucester for custodial services is $2.68 compared to median of $2.10 for the comparative data collected by ICMA. If adequately staffed, the cost to provide in-house custodial services is nearly 27% higher in the City of Gloucester compared to the median. The table, which follows, provides a comparison of the total annual cost to provide custodial services.

	City of Gloucester	Comparative In-House Median	Comparative Contractual Median
Total Square Feet	124,420	124,420	124,420
Total Annual Cost	$332,974	$261,282	$140,600
Potential Cost Savings			**$192,374**

The project team believes that the annual cost savings that the City would accrue from outsourcing custodial services would approximate $192,000 annually.

Recommendation: The City of Gloucester should issue an Invitation to Bid for the City's custodial services.

10. THE POSITION DEDICATED TO MANAGEMENT OF THE CITY'S SOLID WASTE CONTRACT AND RECYCLING SHOULD BE REFOCUSED AS A MANAGEMENT ANALYST FOR THE PUBLIC WORKS DIRECTOR.

Central Services is authorized a position to manage the solid waste contract and to promote recycling. While these are important responsibilities, this does not comprise a full-time workload. This position should be re-focused on providing analytical support to the Public Works Director.

There are a number of challenges that this position should be utilized to address such as goals, objectives, and performance measures, the installation of an automated

maintenance management system, the improvement of security and internal controls in the Central Stores Program, reduction of the inventory in the Central Stores, reduction of the City's fleet, etc. This position should assume responsibility for providing this analytical support.

Recommendation: The position allocated to manage the solid waste contract and to promote recycling should be re-focused on providing analytical support to the Public Works Director with an office in close proximity to the Public Works Director.

11. SOLID WASTE SERVICES SHOULD BE FUNDED AS AN ENTERPRISE FUND.

The enterprise fund statute, MGL Chapter 44 §53F-1/2 (formerly Chapter 41 §39K), was enacted in 1986. Before that time, communities used special revenue funds authorized under various general laws or special acts in order to separately account for their business type services. These special revenue funds were limited, however, with regard to the services and costs covered. The funds were most commonly authorized for water, gas and electric utility departments and used primarily to account for annual operating costs, not the indirect costs, capital expenditures or fixed assets of the service. The purpose of the enterprise fund statute was to give communities the flexibility to account separately for all financial activities associated with a broader range of municipal services.

An enterprise fund establishes a separate accounting and financial reporting mechanism for municipal services for which a fee is charged in exchange for goods or services such as solid waste collection. Under enterprise accounting, the revenues and expenditures of the service are segregated into a separate fund with its own financial statements, rather than commingled with the revenues and expenses of a general fund.

Financial transactions are reported using standards similar to private sector accounting. Enterprise funds may be established for a utility, health care, recreational or transportation facility. Examples of enterprise funds include public utilities such as water, sewer, trash disposal. Gloucester has already established an enterprise fund for water and sewer service, but not for trash collection and disposal.

The advantages of using the enterprise fund include the following:

- **Demonstrate total cost of service**. With all the direct, indirect (e.g., interdepartmental support, health and insurance costs) and capital costs of providing the service in an enterprise fund, the City will be able to readily identify the true cost of providing a service.

- **Provide useful management information**. With the consolidation of revenues and costs of the service and information on the operating performance (positive or negative) of the fund, the City will have useful information to make decisions on user charges and other budgetary items. The City will be able to analyze how much the user fees and charges support the service and to what extent, if any, the tax levy or other available revenues are needed to subsidize the enterprise fund. The City will also be able to include the fixed assets and infrastructure of the enterprise as assets in the financial statements and recognize the annual depreciation of these assets.

- **Retain investment income and surplus**. Unlike services operating in the general fund or a special revenue fund, all investment earnings and any operating surplus are retained in the enterprise fund rather than closed to the general fund at year-end. Once a surplus is certified as available (similar to free cash), it may be used to fund operating, capital or debt service costs associated with the enterprise.

The revenues and expenditures for solid waste services provided by the City – either by contract or with City staff – should be captured in an enterprise fund, even if the general fund provides financial support for these services.

Recommendation: The expenditures and revenues of solid waste services provided by the City, either through its own staff or through contract, should be funded through an enterprise fund.

12. THE COSTS OF PROVIDING SOLID WASTE COLLECTION SERVICES SHOULD BE FULLY FUNDED THROUGH TRASH STICKERS AND THE SALE OF WASTE BAGS REDUCING PROPERTY TAX RATES SO THAT THIS INCREASE IS REVENUE NEUTRAL.

The City is not fully funding the costs of solid waste collection through its trash stickers. This is clearly evidenced in the table below.

	Revenue	Expenditures
Fiscal Year 2006	$920,000	$1,760,856
Fiscal Year 2007	$1,215,000	$1,832,509

As the table indicates, the City collected a little more than one-half of its costs for solid waste collection in fiscal year 2006. The City should increase the trash sticker fees to fully recover the costs of collection and recycling, while reducing property taxes at the same rate so that the effect is revenue neutral. There are a number of other cities in Massachusetts with higher trash sticker fees. This includes examples such as the cities and towns presented in the table below (based upon rates in effect in September 2006).

City	Trash Sticker
Amherst	$3.00
Chilmark	$4.00
Edgartown	$4.00
Milton	$3.00
Montague	$2.50
Norfolk	$2.10
Northborough	$2.50
Oak Bluffs	$3.75
Sutton	$2.50
Tisbury	$4.00
Warwick	$2.25
Webster	$4.00
West Tisbury	$4.00
Westport	$3.00

In addition, there are a number of cities and towns that charge an annual flat fee to fund solid waste collection and recycling services. In twelve cities and towns, this is in addition to the trash sticker. This includes examples such as the cities and towns

presented in the exhibit on the following page (based upon rates in effect in September 2006). The median annual fee charged by these cities and towns amounts to $45.

The City should, in the process of converting solid waste collection and recycling services to an enterprise fund, use a mix of an annual fee and trash stickers to fund all of the costs of these services. This could be regarded as a new tax. To avoid this perception, the City should make the program revenue-neutral. With a revenue-neutral approach, property taxes would be reduced by the amount that these annual fees are expected to generate. Seekonk, for example, went revenue-neutral when designing their program. The amount of revenue generated was reduced from the tax-base. As a result, residents did not view these fees as new taxes. For many residents, the program actually provides them with a way to reduce their expenses by reducing the amount of solid waste generated and the amount of trash stickers required.

The use of this approach also enables the City to redirect funding to other programs if desired. Before unit-based pricing, financing for Seekonk's $500,000 solid waste program came from the general fund. After the program, the $500,000 was redirected to the school department where it was badly needed. Residents understood and appreciated that the new trash fees enabled the redistribution of tax dollars within the levy limit imposed by Proposition 2-1/2. Similarly, Worcester reduced the solid waste budget as a result of the $700,000 net savings with unit-based pricing and then allocated the savings to other important municipal projects.

Recommendation: The City should use a mix of trash sticker and plastic waste bag revenue and annual fees to fund the costs of solid waste collection and recycling.

Annual Solid Waste Collection Fees Charged by Other Cities and Towns as of September 2006

City or Town	Annual Fee	City or Town	Annual Fee
Amherst	$325	Millis	$50
Ashfield	$25	Needham	$40
Ashland	$138	New Ashford	$50
Attleboro	$204	New Salem	$15
Ayer	$40	Norfolk	$45
Becket	$40	North Adams	$50
Belchertown	$65	North Attleborough	$75
Berkley	$30	North Brookfield	$40
Brockton	$280	Northampton	$10
Brookfield	$120	Northfield	$25
Cheshire	$50	Orange	$10
Chester	$30	Petersham	$15
Chesterfield	$20	Plainfield	$25
Cohasset	$30	Plainville	$120
Concord	$138	Raynham	$50
Dalton	$25	Rehoboth	$10
Deerfield	$50	Royalston	$10
Dunstable	$50	Russell	$20
East Brookfield	$52	Savoy	$40
Foxborough	$180	Scituate	$75
Goshen	$20	Seekonk	$113
Groton	$45	Southampton	$75
Hadley	$50	Spencer	$50
Hampden	$15	Sudbury	$100
Hatfield	$25	Sutton	$25
Hawley	$25	Swansea	$70
Holliston	$200	Tisbury	$5
Hudson	$10	Warwick	$20
Huntington	$20	Wendell	$5
Lakeville	$25	Westhampton	$130
Leverett	$25	Wilbraham	$75
Lunenburg	$70	Williamstown	$65
Medway	$250	Winchendon	$25
Mendon	$200	Windsor	$50

11. ANALYSIS OF ENVIRONMENTAL ENGINEERING

11. ANALYSIS OF ENVIRONMENTAL ENGINEERING

This chapter presents an analysis of the Environmental Engineering Division for the City of Gloucester. This Division is primarily responsible for the oversight of the activities related to the water and wastewater treatment plants, both of which are operated by contract since 1991 and 1984, respectively. The Division manages the City's industrial pre-treatment program, including fats, oil, and grease program (FOG). The Division also administers the City's backflow prevention program. Environmental Engineering is authorized three (3) positions.

The table, which follows, presents a summary of the roles and responsibilities of the positions allocated to the Environmental Engineering Division.

Engineer	1	• Manages and directs the daily activities of the Environmental Engineering Division. • Plans and schedules works, as necessary. • Responsible for the day-to-day contract management of Water and Wastewater Treatment Plant contracts. • Responsible for procuring services for regulatory compliance (e.g., leak detection program, dam inspections, laboratory services, etc.). • Coordinates with the DPW Director and the City Engineer with respect to water and wastewater treatment planning. • Responsible for all State reporting. • Serves as liaison with all regulatory agencies and responsible for ensuring City compliance with all water and wastewater treatment regulations. • Responsible for personnel management of the Division, including interviewing and hiring of staff, performance evaluations, writing job descriptions, etc.
Pre-Treatment Coordinator	1	• Responsible for managing the City's industrial pre-treatment program, including fats, oil and grease program (FOG). • Responsible for granting permits, conducting samples, site inspections and enforcement. • Permits all food service establishments. • Inspects manholes. • Issues industrial user discharge permits, conducts site inspections, compliance sampling and tracks permit requirements. There are 17 permitted facilities in the City. • Prepares all correspondence to permitees, including notices of violations. Assess penalties, if warranted.

Cross Connection Inspector	1	• Responsible for establishing and monitoring the City's cross connection program and establishing new procedures as appropriate. • Performs testing of backflow devices. • Identifies facilities and businesses for which a backflow prevention device is required. • Maintains database of backflow devices. • Responsible for the testing and installation of backflow prevention devices (twice annual testing). • Prepares correspondence including notices of violations. • Responsible for the hydrant permit program and maintaining hydrant location information. • Responsible for the public education program for cross connections, which includes businesses and residential contacts. • Responsible for monitoring the reservoirs and conducting dam inspections. • Responsible for sampling reservoirs for compliance with Mass Highway No Salt Zone program. • Responds to residents' concerns about water quality.
Principal Clerk	1	• At the time of the study, this position was newly authorized and had not been filled. • Position created to provide administrative support to the Division, including processing and tracking of data.

The sections, which follow, provide an analysis of the Environmental Engineering Division.

1. THE RESPONSIBILITY FOR THE CROSS CONNECTION PROGRAM AND THE ADMINISTRATION OF THE INDUSTRIAL WASTE PRE-TREATMENT PROGRAM SHOULD BE CONSOLIDATED.

The Environmental Engineering Division allocates a cross connection inspector to the City's cross connection program. This program identifies facilities for which backflow prevention devices are required, monitors testing and reporting compliance, as well as conducts plan reviews for new devices. There are approximately 442 cross connection devices throughout the City – 303 are RPS devices, tested every 6 months for $45 per test, and 139 are double check valves, checked on a yearly basis. Revenues for this program are approximately $34,000.

At the same time, the Department is also authorized a Pre-Treatment Coordinator. The Pre-Treatment Coordinator is assigned responsibility for

administration of the industrial pre-treatment program. The City has seventeen (17) permitted facilities for which periodic testing and inspection are required. This program also targets food service establishments and non-industrial commercial entities in implementation of the City's FOG (fats-oil-grease) program.

There is insufficient workload to warrant these two positions. This conclusion is based upon the following:

- There are only seventeen (17) permitted facilities for which industrial waste pre-treatment periodic testing and inspection are required, generally not less than once a year depending on the type of waste flows;
- There are a total of approximately thirty-eight restaurants that would need to be checked once every six to twelve months as part of the fats, oils and grease program; and
- 303 RPS backflow prevention devices are tested every 6 months and 139 double check valves are checked on a yearly basis.

This is simply insufficient workload to warrant two full-time positions. The Pre-treatment Coordinator should assume responsibility for the administration of the cross-connection program. This would require that this position obtain certification from the State of Massachusetts to assume this responsibility.

Annual Cost Increase		Annual Cost Decrease	
N / A		Eliminate the Cross Connection Inspector position	$58,800

Recommendation: Eliminate the Cross Connection Inspector position.

2. THE ENVIRONMENTAL ENGINEERING DIVISION SHOULD FILL THE VACANT PRINCIPAL CLERK POSITION AS BUDGETED.

The Environmental Engineering Division should fill the vacant Principal Clerk position as budgeted. This position should provide support to the Environmental Engineer and the Pre-Treatment / Cross Connection Program, and should handle the

administration of the backflow device monitoring as well as the Pre-Treatment Program.

Recommendation: The Environmental Engineering Division should fill the vacant Principal Clerk position as budgeted. This position should assist with the administration of the industrial pre-treatment program and the cross connection program. Technical functions should be provided by the Pre-Treatment Coordinator.

12. ANALYSIS OF THE PLAN OF ORGANIZATION

12. ANALYSIS OF THE PLAN OF ORGANIZATION

This chapter presents an analysis of the plan of organization of the Public Works Department. The focus of the chapter includes the elements listed below.

- Levels of management;
- Spans of control;
- Workload and responsibility of each manager;
- The efficiency and effectiveness of the organizational structure; and
- The impact of the lines of authority, spans of control, and workload / responsibilities on the ability of management positions to ensure quality control and performance.

1. IN EVALUATING THE PLAN OF ORGANIZATION OF THE PUBLIC WORKS DEPARTMENT, A NUMBER OF PRINCIPLES SHOULD BE CONSIDERED.

In evaluating the plan of organization for the Public Works Department, the Matrix Consulting Group utilized a number of principles for organizational structure. These principles are presented in the paragraphs below.

- **The Public Works Department should be organized on a "form follows function" basis** with a clear, distinct and comprehensive sense of purpose or mission for each division. Functions are grouped consistent with their periodic interaction, management systems, delivery of services that are linked in some way, etc., resulting in functional cohesion.
- **The Department's organizational structure should foster accountability.** The organizational structure fosters accountability among management and supervisory staff.
- **The plan of organization should enhance communication and coordination.** The number of handoffs / exchanges required among different divisions providing service to the public is minimized. The structure enhances shared knowledge and understanding among divisions. The channels of communication are clear and consistent.

- **Staff resources should be utilized efficiently**. The plan of organization minimizes administrative overhead. Workload can be distributed / shared to maximize the productivity of staff through peaks and valleys, and offer cross-functional capabilities. Processes can be standardized to enhance the efficiency and customer responsiveness of services (e.g., the maintenance management process).

- **The potential of human capital should be maximized**. The plan of organization enhances career development opportunities, training, and recruitment and retention.

- **The services provided to customers should be responsive**. The plan of organization enables staff to provide better service to the public. Customers are the hub – with the Public Works Department designed around them.

- **Each division in the Public Works Department should be placed at a level in accordance with its importance in achieving departmental goals**. Divisions have not been placed too high in the departmental structure or too low relative to their importance.

- **The span of control for any manager or supervisor should not exceed the number which can be feasibly and effectively supervised**. The trend is to widen span of control.

- **The number of layers of management should not result in a tall, narrow configuration for the Public Works Department**. Organizations with many layers are associated with centralized decision-making. Flatter organizations tend to have decentralized decision-making, as authority for making decisions is given to the front-line employees.

- **The plan of organization should enhance the effectiveness of the Public Works Director**. The organizational structure limits the span of control of the Public Works Director, provides analytical support to develop goals, objectives, and performance measures, and provides resources to build and connect with the residents and businesses in Gloucester.

Reorganization efforts that ignore these principles could create new, unintended and unfortunate consequences for the future.

2. THESE PRINCIPLES FOCUSED THE ANALYSIS OF ALTERNATIVES FOR THE PUBLIC WORKS DEPARTMENT ORGANIZATIONAL STRUCTURE.

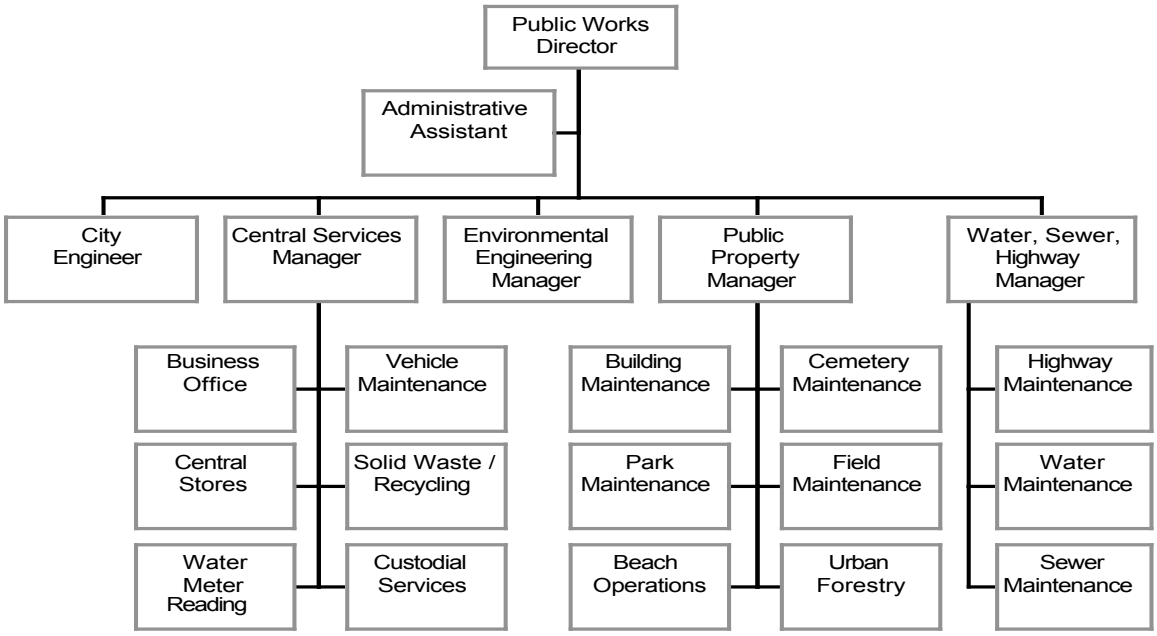
The principles described in the previous section were converted into a matrix to enable an evaluation of the current plan of organizational structure as well as each organizational alternative for the Public Works Department. The primary purpose of the matrix was to focus the project team on the alternatives and to evaluate each of those alternatives using these criteria. This matrix is presented below.

CRITERIA
Organization and Structure
• Clear lines of accountability
• Spans of control/number of management layers
• Functional cohesion
Communication and Cohesion
• Hand-offs/exchanges (internal/external)
• Physical/virtual proximity
• Shared knowledge/understanding
Resource Utilization (Cost)
• Administrative overhead
• Workload management (even distribution)
• Process efficiency/standardization
• Resource sharing
Human Capital
• Career development
• Training
• Recruitment and retention
Agility and Flexibility of the Organization
• Scalability (ability to manage peaks and valleys)
• Adaptability (cross functional capability)
Service Quality and Responsiveness
• Customer service
• Performance management
• Quality control checks and balances
• Consistency of policy/procedure application

From the analysis of each of the alternatives using these criteria, a set of arguments for and against each alternative was constructed, leading to a recommendation of a preferred alternative.

3. THE CURRENT PLAN OF ORGANIZATION FOR THE PUBLIC WORKS DEPARTMENT HAS A NUMBER OF ADVANTAGES AND DISADVANTAGES.

The chart presented below presents the current administrative plan of organization for the Public Works Department.



The advantages and disadvantages to the current plan of organization are presented in the table below.

Advantages	Disadvantages
• Responsibility for management of the City's infrastructure has been centralized within Public Works. • The span of control for the Public Works Director is reasonable with only five managers reporting to the Director.	• The management of facility maintenance services is fragmented. The Central Services manager is responsible for custodial services, while the Public Properties Manager is responsible for building maintenance. • The Public Works Director lacks analytical support for such tasks as budget preparation and analysis, development of goals, objectives, and performance measures, etc. • The management of utilities is fragmented. The Central Services Manager is responsible for water meter reading, the Water-Sewer-Highway Manager is responsible for management of the maintenance and repair of the water distribution system and the wastewater collection system.

Advantages	Disadvantages
	The Environmental Engineering Manager is responsible for administration of the treatment plant contracts, the industrial waste pre-treatment program, and the cross connection program. • The spans of control, in some circumstances, are limited. Within the Water-Sewer-Highway or Operations Division, the Manager supervises three Foremen / Craftsman. These Foreman / Craftsman, in turn, supervise seven to ten staff. The Public Properties Division Manager has a one-over-one supervisory relationship. The Manager supervises a Division Foreman who, in turn, supervises eight and one-half staff. The Environmental Engineer supervises two staff.

The current plan of organization clearly offers a number of disadvantages. The current plan of organization has worked for the Department, and the Department has received high levels of satisfaction from its customers. However, the current plan of organization has a number of issues associated with it.

4. THE PLAN OF ORGANIZATION FOR THE PUBLIC WORKS DEPARTMENT SHOULD BE MODIFIED.

The proposed plan of organization is presented in the exhibit at the end of this chapter. Important points to note concerning this proposed plan are presented below.

- The responsibility for the management of environmental engineering, including the supervision of the Environmental Engineer, would be reallocated to the City Engineer. The span of control for the City Engineer would be seven including two Assistant City Engineers, the Environmental Engineer, the Civil Engineer, the Junior Civil Engineer, a Senior Engineering Aide, and a Principal Clerk.

- The Central Services Manager would be responsible for the management of building maintenance, custodial maintenance, vehicle maintenance, and the business office.

- A Maintenance Services Manager would be responsible for the supervision of water distribution, wastewater collection, sewer maintenance, and park maintenance. In this case, the Division Foreman from the Public Properties

Division would be responsible for the supervision of park maintenance, field maintenance, cemetery maintenance, and urban forestry.

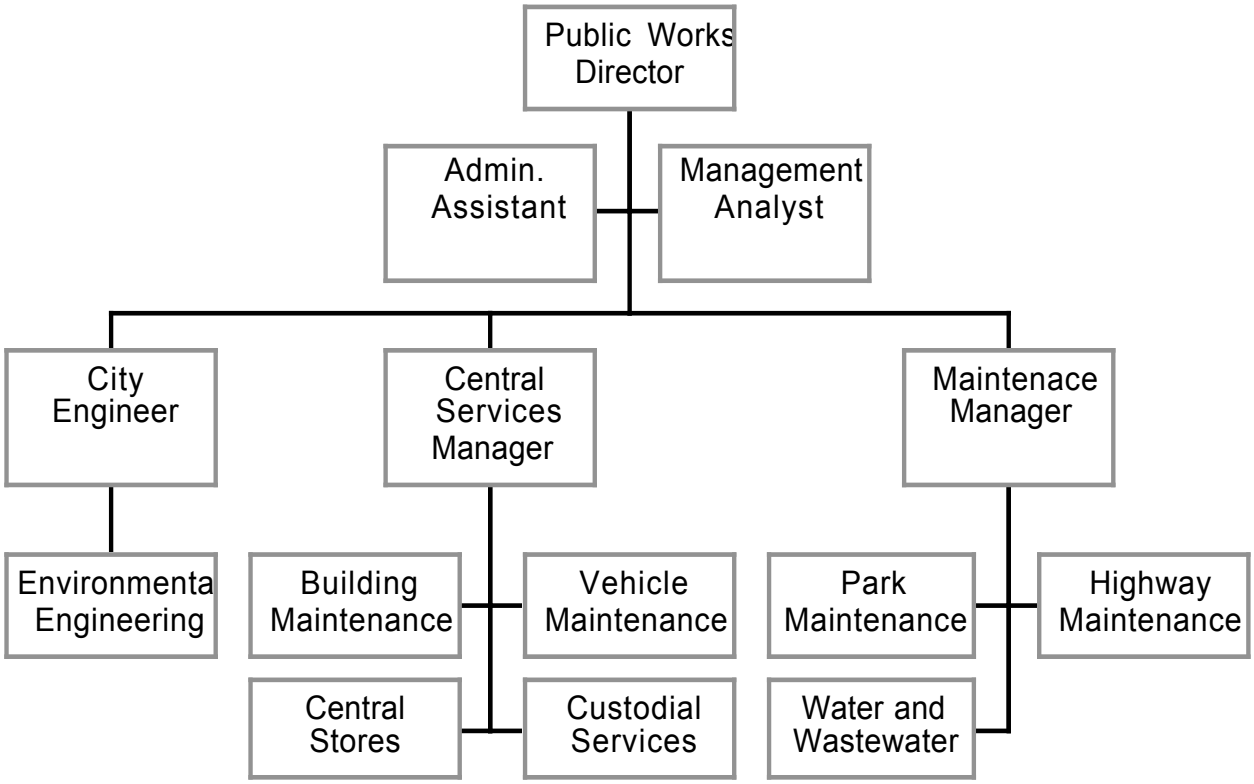
- One of the division-head positions – either the Public Properties Manager or the Water-Sewer-Highway Manager – would be eliminated.

- One of the two Foreman / Craftsman positions assigned to water and sewer should be eliminated. The span of control for the remaining Foreman / Craftsman would be three Working Foreman.

The annual cost impact of this proposed plan of organization is presented in the table below.

Annual Cost Increase		Annual Cost Decrease	
N / A	$0	Eliminate a division-head position (either the Public Properties Manager or the Water-Sewer-Highway Manager).	$77,500
		Eliminate one of the two Foreman / Craftsman positions assigned to water and wastewater	$57,700
Annual Cost Increase	**$0**	**Annual Cost Decrease**	**$135,200**

Recommendation: Eliminate a division-head position (either the Public Properties Manager or the Water-Sewer-Highway Manager).

Recommendation: Eliminate one of the two Foreman / Craftsman positions assigned to Water and Wastewater.

Proposed Plan of Organization for the Public Works Department