12. Maintenance and Materials Management

- **Neither the Water Supply and Treatment Division nor the City Distribution Division have their own consolidated policies and procedures manuals to assist in controlling maintenance operations. The absence of up-to-date maintenance policies and procedures manuals is a serious deficiency that should be corrected on a priority basis. Further, neither Division has adequate maintenance management reporting. Such reporting is a basic and essential component of professional management.**

- **Although the MAXIMO Computerized Maintenance Management Software system is standard among all of the Public Utilities Commission's divisions, the divisions have not implemented the MAXIMO system uniformly.**

- **While the Water Supply and Treatment Division currently uses MAXIMO for material tracking, cost tracking, purchasing, and planning some preventive maintenance, it only uses MAXIMO minimally for planning work other than preventive maintenance work and not at all for scheduling maintenance operations, although the scheduling function is one of the major benefits of a computerized maintenance management software system.**

- **The City Distribution Division does not have adequate procedures for planning and scheduling maintenance work. Maintenance planning and scheduling is a vitally important aspect of maintenance effectiveness and efficiency. The City Distribution Division's use of MAXIMO for planning and scheduling is almost non-existent.**

- **Organizations with adequate planning and scheduling processes can achieve significant productivity improvement through implementation of a computerized maintenance management software system. The Budget Analyst conservatively estimates that a 5 percent improvement in overall productivity can be achieved in both Divisions' maintenance activities. A 5 percent productivity improvement would be the equivalent of approximately seventeen additional positions, which would otherwise cost approximately $1,700,000 annually in base salaries and mandatory fringe benefits.**

- **The Divisions' Materials Management Sections do not have documented mission statements, performance measures, or objectives. Further, the Materials Management Sections do not have policies and procedures manuals, which is a significant deficiency.**

- **The Water Supply and Treatment Division and City Distribution Division do not have adequate inventory records of tools and equipment. In response to a Budget Analyst request for a copy of the most recent inventory of shop tools and equipment, the Water Supply and Treatment Division's reply was that each supervisor or foreman is responsible for his or her crews' tools and equipment, but that there had not been an organized inventory of such equipment in some time. The City Distribution Division's reply was that the date of the last inventory is unknown, a copy of the inventory results does not exist, and that the Division would conduct an inventory by the end of the current fiscal year.**

- **The Water Supply and Treatment Division's most recent physical inventory was performed from June 29 through July 1, 2004. The before count inventory was $429,987 and the after count inventory was $420,206. Thus, the inventory "shrinkage" was $9,781 or 2.27 percent of the before count inventory value. The auditor performed counts of various inventoried items at 14 bin locations and found that the counts matched the information in the computer records on 12 of the 14 counts. However, on more than one occasion, the storeroom staff had to search for additional bin locations in order to tally the item counts as contained in the computer records.**

- **The City Distribution Division's most recent physical inventory of its storeroom was performed on December 18 and 19, 2004. The before count inventory value was $3,482,178 and the after count inventory value was $3,404,532. Thus, the "shrinkage" was $77,646, or 2.23 percent of the before count inventory value. The Budget Analyst performed counts of various inventoried items at six storage bin locations and found that the storage bin counts matched the information in the computer records on only three of the six counts.**

Divisions' Missions and Organizational Structures

The Water Supply and Treatment Division and the City Distribution Division are major organizational elements of the Public Utilities Commission's Water Enterprise. The other major elements of the Water Enterprise are: (a) Hetch Hetchy Water and Wholesale Power, (b) Water Quality, and (c) Natural Resources.

Water Supply and Treatment Division

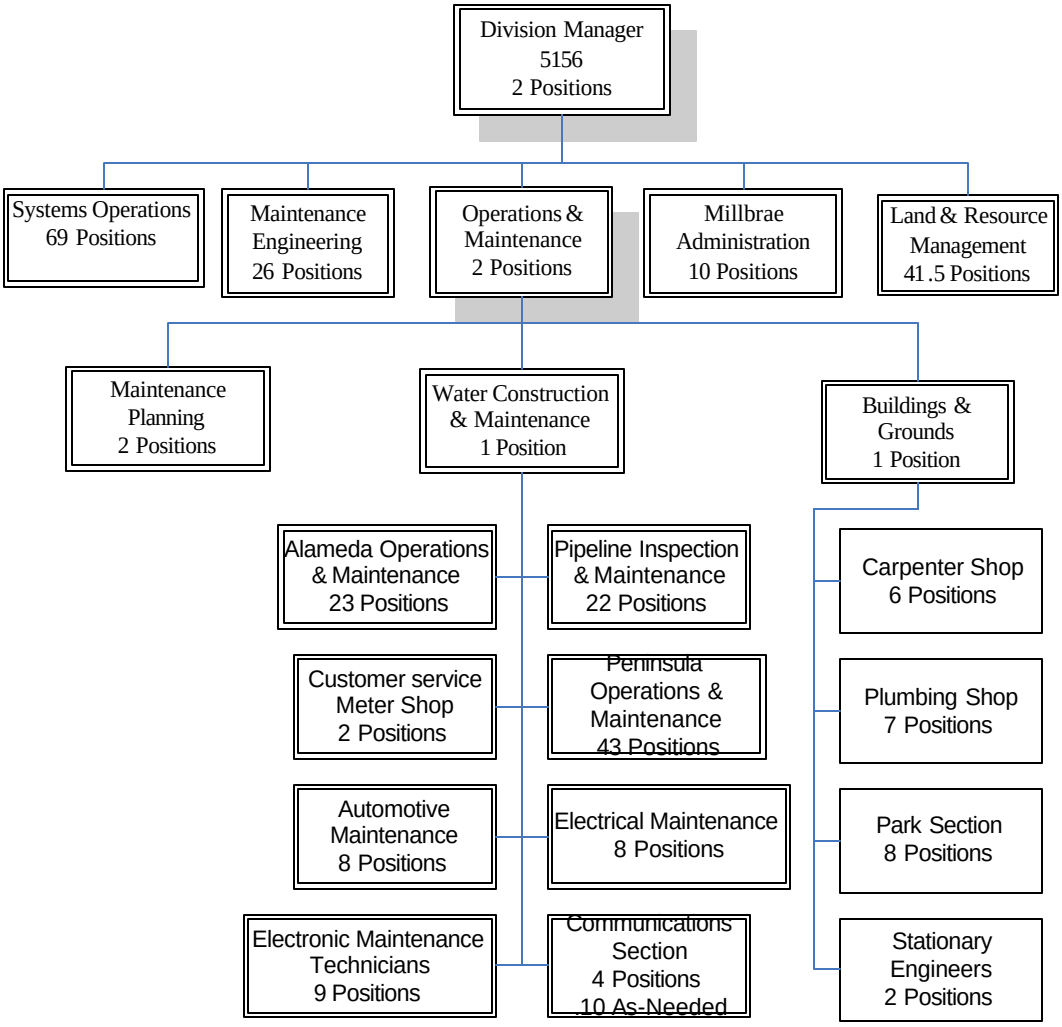
Water from Hetch Hetchy Reservoir is transported by gravity through approximately 121.6 miles of tunnels and pipes to the Alameda East Portal near Sunol in Alameda County, where responsibility for transport of the water is transferred from the Hetch Hetchy Water and Wholesale Power Division to the Water Supply and Treatment Division. The Water Supply and Treatment Division is responsible for supplying water to 28 municipalities in Alameda, Santa Clara, and San Mateo Counties, in addition to the City.

The mission of the Water Supply and Treatment Division is to operate as an effective, reliable water supplier while managing resources in an environmentally sound manner and supporting the health, productivity, and professional development of its employees. The mission of the Maintenance Section is to maintain regional water assets in a manner that supports these goals.

The Water Supply and Treatment Division organizational chart, with the maintenance organization elaborated, is shown in Exhibit 12.1 below:

Exhibit 12.1

Water Supply and Treatment Division Organizational Chart



Source: Water Enterprise Final Budget Book: 2004-2005

To accomplish its mission during FY 2004-2005, the Water Supply and Treatment Division is authorized 301.53 full-time equivalent (FTE) positions, including 276.5 FTE operating budget positions, 22 FTE capital-funded positions, and 3.03 FTE temporary positions. Funding in the amount of $55,477,061 has been appropriated to the Water Supply and Treatment Division for FY 2004-2005 as shown in Table 12.1 below.

Table 12.1

Water Supply and Treatment Division
Appropriated Funding – FY 2004-2005

Water Supply and Treatment Division Organizational Element	Budgeted Amounts
Administration	$22,357,481
Operations and Maintenance	14,342,063
Maintenance Engineering	2,436,781
Systems Operations Management and Treatment	11,354,315
Land and Resources Management	4,986,421
Total Appropriation	**$55,477,061**

Source: Water Enterprise Final Budget Book: 2004-2005

The Board of Supervisors also appropriated $24,345,000 in capital funds for Water Supply and Treatment Division projects in FY 2004-2005, including $6 million for water main replacement and $4 million for Peninsula Sportsman's Club Clean Up.

City Distribution Division

The mission of the City Distribution Division is to distribute high quality water reliably to San Francisco customers. The City Distribution Division assumes responsibility for the four transmission mains at the City's southern boundary and maintains those four transmission main lines to their endpoints, two each into the Sunset and the University Mound Reservoirs. Thereafter, water is distributed to City users through a system of transmission, feeder, and distribution mains, pumps, reservoirs, tanks, and service lines. Major roles included in the Division's mission are as follows:

- Operate and maintain storage and distribution facilities to a high standard of safety and reliability.
- Maintain lands and properties consistent with public health and neighborhood concerns.
- Promote diversity and the health, safety, and professional development of City Distribution Division employees.

The City Distribution Division's responsibilities are all within the City's geographical boundaries. The City Distribution Division's primary responsibilities are to operate and

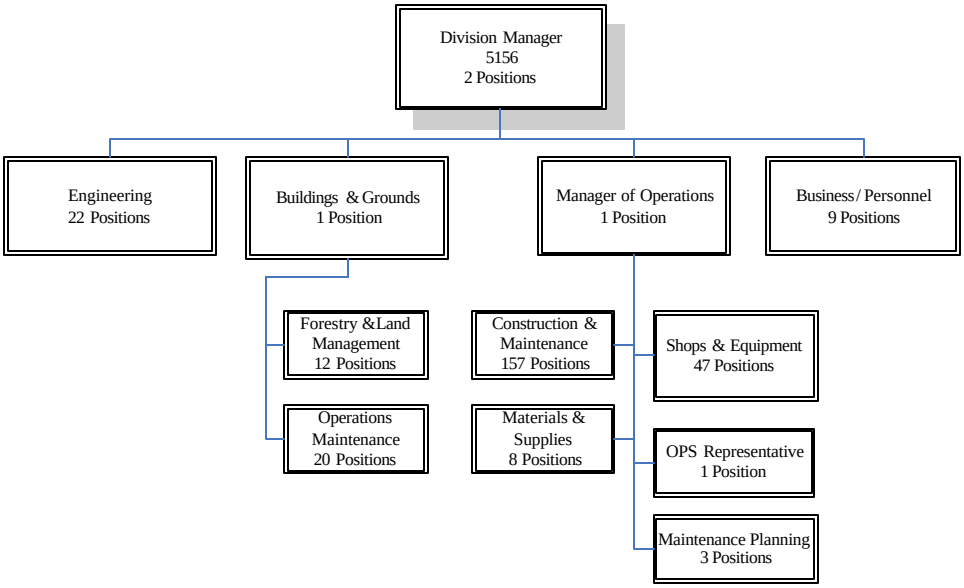
maintain water distribution facilities and provide equipment maintenance and other services as described below:

- Operate and maintain 22 pump stations, ten reservoirs, ten disinfection stations, seven storage tanks, eight pressure-reducing stations, and ancillary equipment within the City.
- Maintain 984 acres of San Francisco Public Utilities Commission property within the City.
- Maintain approximately 1,200 miles of water mains, as well as repair and replace service lines and connection/meters, and maintain 13,000 valves within the City, Yerba Buena Island, and Treasure Island.
- Replace over 5,000 water meters per year.
- Respond to all fires of two-alarms and above.
- Operate a 24-hour dispatch.
- Engineer and design water main, feeder extensions, and replacements.
- Distribute chloraminated water in San Francisco.
- Manage an equipment fleet consisting of 202 general-purpose vehicles and 228 other vehicles and pieces of motorized equipment.

To accomplish its mission during FY 2004-2005, the City Distribution Division is authorized 285.34 full-time FTE positions, including 212 FTE operating budget positions, 71 FTE capital-funded positions, and 2.34 FTE temporary positions. The City Distribution Division is organized into the major elements shown in Exhibit 12.2 below.

Exhibit 12.2

City Distribution Division Organizational Chart



Although funding in the amount of $111,908,898 has been appropriated to the City Distribution Division for FY 2004-2005, as shown in Table 12.2 below, discretionary funding for the Division's operations and maintenance activities is only approximately $37.9 million because a total of approximately $74 million is designated for debt service payments ($38.4 million), Public Utilities Commission Administrative Services ($16.6 million), and water purchases ($19 million).

Table 12.2

City Distribution Division
Appropriated Funding – FY 2004-2005

City Distribution Division Organizational Element	Budgeted Amounts
Maintenance Shops	$5,051,246
Administration	65,613,892
Buildings and Grounds	6,310,134
Engineering	1,264,906
Construction and Maintenance	14,296,591
Departmental Transfer Adjustment [1]	19,037,000
Recovery for Services Performed	335,129
Total Appropriation	**$111,908,898**

Source: Water Enterprise Final Budget Book: 2004-2005

The Board of Supervisors also appropriated capital funds in the amount of $26,641,000 for City Distribution Division projects in FY 2004-2005, including $6 million for water main replacement and $4.415 million for rehabilitation of the City's largest reservoir, the Sunset Reservoir.

Maintenance Management Policies and Procedures

The maintenance operations of the Water Supply and Treatment Division and the City Distribution Division are unique in the City. The facilities, pumps, and apparatus for conveying water to the City's reservoirs, and thence to users via feeder and distribution water mains, are unlike those of other City departments. However, neither the Water Supply and Treatment Division nor the City Distribution Division have their own consolidated policies and procedures manuals to assist in controlling maintenance operations. The absence of up-to-date maintenance policies and procedures manuals is a serious deficiency that should be corrected on a priority basis. Policies and procedures serve multiple functions, including the following:

- A self-regulating control standard for performing work.
- An efficiency and effectiveness tool incorporating best practices or lessons learned.

[1] Transfer from the City Distribution Division to the Hetch Hetchy Water and Wholesale Power Division for purchases of water.

- A training tool for newly assigned personnel.

A maintenance policies and procedures manual serves to standardize such maintenance functions as setting maintenance priorities, controlling tools and equipment, recording maintenance time, providing an overview of MAXIMO, and providing means of increasing "wrench time."[2] Examples of additional topics appropriate for inclusion in policies and procedures manuals are shown below in Table 12.3 below.

Table 12.3

Maintenance Management Policies and Procedures Manual Example Contents

• Work Order Procedures	• Preventive Maintenance
• Backlog Tracking	• Warranty Tracking
• Daily Work Schedule	• Failure Analysis
• Weekly Maintenance Plan	• Contractor Control
• Job Card Procedure	• Job Control
• Work Assignment Monitoring	• Procedure and Form Revision
• Mechanical Inspection	• Management Reporting

Source: Water Pollution Control Division's *Maintenance Management Policies and Procedures Manual*

A policies and procedures manual should be a dynamic document, continually incorporating updated information. The Water Supply and Treatment Division and the City Distribution Division can use appropriate sections of other departments' policies and procedures manuals as starting points in the development of its own. However approached, a good policies and procedures manual is a guidance, control, and training tool that the two Divisions need to develop on a priority basis.

Maintenance Planning and Scheduling

Maintenance planning and scheduling is a vitally important aspect of maintenance effectiveness and efficiency. Effective maintenance operations can be planned and scheduled in a manual mode, as currently described in the Water Pollution Control Division's *Maintenance Management Policies and Procedures Manual*, or, as is the practice in many organizations, using a computerized maintenance management software

[2] Productivity is frequently measured by "wrench time" which is defined as the amount or percentage of time that a craftsperson is actually using his or her tools to perform maintenance work. Wrench time is a measure of the craftsperson's productivity and is impacted by a variety of factors, such as the amount of time spent waiting for parts, traveling to and from the job site for tools or materials, or waiting for equipment to be made available for maintenance.

system. Although the MAXIMO Computerized Maintenance Management Software system is standard among all of the Public Utilities Commission's enterprise departments, the enterprise departments have not implemented the MAXIMO system uniformly. The MAXIMO system was implemented beginning in 1999 and completed in mid-2000 at an approximate cost of $350,000.

The Water Supply and Treatment Division and the City Distribution Division currently use the MAXIMO Computerized Maintenance Management Software system for material tracking, cost tracking, purchasing, and planning some preventive maintenance. However, the two Divisions use the MAXIMO Computerized Maintenance Management Software system minimally for planning work other than preventive maintenance work and not at all for scheduling maintenance operations, although the scheduling function is one of the major benefits of a computerized maintenance management software system.

The City Distribution Division does not have adequate procedures for planning and scheduling maintenance work. In that regard, the City Distribution Division's use of MAXIMO for planning and scheduling is almost non-existent.

The Water Supply and Treatment Division position authorizations for FY 2004-2005 include two Classification 7262 Maintenance Planner positions to lead the maintenance planning and scheduling functions. Both positions are filled.

The City Distribution Division's position authorizations for FY 2004-05 include three positions to lead the maintenance planning and scheduling functions, as follows:

- Classification 7263 Maintenance Manager.
- Classification 7262 Maintenance Planner.
- Classification 7205 Chief Stationary Engineer.

However, only the Chief Stationary Engineer position is filled, and the incumbent is not engaged in planning and scheduling.

Additionally, the Board of Supervisors approved one new Classification 7263 Maintenance Manager and one new Classification 7262 Maintenance Planner position in the FY 2005-2006 budget to support the proposed asset management program.

Because maintenance planning and scheduling is an important component of maintenance efficiency and effectiveness, the Assistant General Manager, Water should fill the vacant maintenance manager and maintenance planner positions and ensure that the Classification 7205 Chief Stationary Engineer is assigned to maintenance planning functions.

Need for Improved Planning and Scheduling of Maintenance Projects

As previously stated, wrench time is a critical determinant of maintenance productivity and, therefore, of a maintenance organization's effectiveness. Maintenance industry literature cites productivity rates, as measured by wrench time, of approximately 25 percent to 35 percent as typical for maintenance organizations performing maintenance operations similar to those of the Water Supply and Treatment Division and the City Distribution Division. Given the travel times to some of the facilities requiring maintenance, one-way travel times of up to 90 minutes for Water Supply and Treatment Division work sites and up to 30 minutes for City Distribution Division work sites are required. Under such conditions, failure to bring a critical tool or replacement part can drastically affect a day's productivity. Maintenance planning and scheduling can reduce such occurrences.

The Water Supply and Treatment Division and the City Distribution Division:

- Do not set or track productivity measures such as wrench time.
- Do not use the scheduling module in MAXIMO, which reportedly has deficiencies that are being fixed by the vendor.
- Use the MAXIMO planning module on a limited basis.

In order to reduce the percentage of non-productive time in its maintenance activities and improve its overall maintenance performance, the two Divisions should thoroughly integrate planning and scheduling into their maintenance operations, including using MAXIMO to the extent of that system's capabilities.

Organizations with adequate planning and scheduling processes can achieve significant productivity improvement through implementation of a computerized maintenance management software system. A 5 percent productivity improvement in the Water Supply and Treatment Division's maintenance activities would be the equivalent of approximately seven additional positions, which would otherwise cost approximately $700,000 in base salaries and mandatory fringe benefits. A 5 percent productivity improvement in the City Distribution Division's maintenance activities would be the equivalent of approximately ten additional positions, which would otherwise cost approximately $1,000,000 in base salaries and mandatory fringe benefits.

Maintenance Management Performance Measurement and Reporting

The Water Supply and Treatment Division and the City Distribution Division have inadequate maintenance management reporting. Reporting is a basic and essential component of professional management. Comparison of actual performance to planned accomplishment is absolutely necessary to an effective and efficient operation. Planning and controlling is a dynamic process: learning gained from actual experience should be incorporated into updated standards and into new plans. Accurate reporting is required by (a) maintenance managers in order to improve their operations, and (b) executive management in order to assess the performance of maintenance management and to

coordinate the activities or operations and support functions with the maintenance function.

Although the Water Supply and Treatment Division and the City Distribution Division collect data on time charged to work order, they do not enter reliable estimated times into the MAXIMO system. As a consequence, the two Divisions are unable to measure productivity (actual hours of work performed compared to estimated hours of work to be performed). Further, in order to determine compliance (all hours compared to planned hours), all outstanding work and performance measures must be entered into MAXIMO, but the two Divisions do not enter all performance measures.

The Water Pollution Control Division reports its maintenance performance quarterly for the months ending in March, June, September, and December by publishing a *Management by Objectives Report*; however, the Water Supply and Treatment Division and City Distribution Division do not produce such a report. The *Management by Objectives Report* produced by the Water Pollution Control Division uses efficiency and effectiveness ratios and other metrics that show the performance of most of the maintenance crews and related disciplines assigned to the its Maintenance Section. The primary metrics developed are shown in Table 12.4 below:

Table 12.4

Management by Objective Report Characteristics

Report Section Name	Type Measure	Numerator	Denominator
Productivity	Efficiency	Estimated Hours Required to Complete the Job	Actual Hours Expended to Complete the Job
Compliance	Effectiveness	Hours of Priority 1 Work Planned	Hours of All Work Performed
Backlog	Combination Efficiency and Effectiveness	Work Planned, In Progress, and Awaiting Completion	None

Source: Budget Analyst' analysis of *Management by Objectives Report*

The *Management by Objectives Report* is a useful management tool. The Water Supply and Treatment Division and the City Distribution Division should produce their own *Management by Objectives Reports.* As the Budget Analyst recommended in the Water Pollution Control Division component of the *Phase I Public Utilities Commission Management Audit-Clean Water Enterprise Fund* report, the two Divisions should add to the usefulness of the report by setting standards for each of the management by objectives measures, adjusted for seasonal variations.

The City Distribution Division Manager should compare the newly established MAXIMO performance measures for the City Distribution Division against measures proposed in American Water Works Association literature and the literature of other

water associations, and incorporate additional and/or replacement performance measures as deemed appropriate. Further, the City Distribution Division Manager should ensure the accuracy of the data collected and reported on actual performance.

Using MAXIMO Data to Justify and Analyze Resource Requests

The MAXIMO Computerized Maintenance Management Software system has extensive data collection and reporting capabilities, including backlog, planned work, and maintenance history data. Given these capabilities, the Water Supply and Treatment Division and City Distribution Division's requests for maintenance resources should be accompanied by backlog, planned work, and maintenance history data.

The Public Utilities Commission is currently undertaking implementation of a department-wide asset management program, which includes identifying all assets, including historical costs, maintenance history, and projected future costs and lifespan. In conjunction with the asset management program implementation, the Water Supply and Treatment Division and the City Distribution Division should develop accurate workload data, such as preventive maintenance work required by each asset.

Materials Management

The mission of the Water Supply and Treatment Division and the City Distribution Division's materials management staff members is to provide required materials at the correct location, at an economical cost, and in a timely manner. Their three functions are:

- Procurement: the function of procurement is to procure materials, equipment, and spare parts at an economical price and in a timely manner.
- Inventory Control: the function of inventory control is to ensure that the storeroom is stocked with critical items and items whose usage warrants stocking.
- Storeroom Operation: the function of the storeroom is to receive, store, issue, or deliver material to users in the most efficient means available.

The Water Supply and Treatment Division's materials management function has six permanent positions, as follows:

- Classification 1936 Senior Storekeeper.
- Classification 1930 Warehouse Worker.
- Classification 1934 Storekeeper.
- Classification 1950 Assistant Purchaser.
- Classification 1632 Senior Accounting Clerk (two positions).

The City Distribution Division's materials management function has eight permanent positions, as follows:

- Classification 1944 Materials Coordinator (the employee holding this lead position has been on an extended absence).
- Classification 1950 Assistant Purchaser (two positions).
- Classification 1934 Storekeeper (four positions).
- Classification 1920 Inventory Clerk.

Lack of a Materials Management Policies and Procedures Manual

The Water Supply and Treatment Division and the City Distribution Division's Materials Management Sections do not have a documented mission statement, performance measures, or objectives. Further, the Materials Management Sections do not have policies and procedures manuals, which is a significant deficiency.

Examples of topics covered in materials management policies and procedures manuals are as follows:

Table 12.5

Materials Management Policies and Procedures Manual Example Contents

• Policy and Functions of Materials Management	• Authorization to Withdraw Materials from the Warehouse
• New Stock Requests	• Receiving
• Warehouse Issues and Credits	• Bin Locations
• Warehouse Scheduled Deliveries	• Low Value Items (Free Stock)
• Back Orders and Stock Reservations	• Repaired Components (Stock)
• Inventory Stratification	• Cost of Ordering and Cost of Carrying
• Active Inventory	• Inactive Inventory
• Technical Review	• Cycle Inventory
• Purchase Requisitions	• Management Reporting

Source: Water Pollution Control Division's *Maintenance Management Policies and Procedures Manual*

The Water Supply and Treatment Division Manager advises that the development of a policy and procedures manual for the Water Supply and Treatment Division is a priority work item for FY 2005-2006 and a task force of operations, maintenance, treatment plant, and administrative staff has already begun meeting.

Storeroom Operations

Water Supply and Treatment Division

The Water Supply and Treatment Division's main storeroom, located at the Division's facility at 1000 El Camino Real, Millbrae, contains approximately 1,290 line items, including automotive items. A much smaller storeroom at the Sunol facility contains approximately 240 line items.

The Water Supply and Treatment Division's most recent physical inventory was performed from June 29 through July 1, 2004. The before count inventory was $429,987 and the after count inventory was $420,206. Thus, the inventory "shrinkage" was $9,781 or 2.27 percent of the before count inventory value.

The auditor performed counts of various inventoried items at 14 bin locations in order to obtain an indication of the accuracy of the information contained in the computer records. The counts matched the information in the computer records on 12 of the 14 counts, although some of the items checked were located in more than one bin location because of physical limitations. On more than one occasion, the storeroom staff had to search for additional bin locations in order to tally the item counts as contained in the computer records.

The bin location labels were difficult to read in some instances and require cleaning or replacement. The layout of the bin locations and the facility itself are sub-par when compared to the storerooms at the Water Pollution Control Division and the Hetch Hetchy Water and Wholesale Power Division.

The Budget Analyst obtained a listing from the Water Supply and Treatment Division storeroom staff of inventory items with zero issues for the six-month period of August 17, 2004 through February 17, 2005. The listing includes 551 line items with a total value of $89,827. Many are very low unit cost items such as fuel and oil filters; however, some items, such as couplings, flanges, and valves have unit costs in the hundreds of dollars. The Water Supply and Treatment Division Manager should direct a review of inventory items for the purpose of determining which items should be stocked regardless of demand history, which items should be retained in inventory but only reordered when there is a demand, and which items should be reported for disposal.

City Distribution Division

The City Distribution Division's main storeroom at 1990 Newcomb Avenue is spacious and stores approximately 1,000 line items, some of which are very large, plus automotive items which are stored in the automotive shop. In addition to the main storeroom and much smaller ancillary storerooms located at 1990 Newcomb Avenue, the Materials Management Section stores many items outside in the maintenance yard and at the University Mound Reservoir.

The City Distribution Division's most recent physical inventory of its storeroom was performed on December 18 and 19, 2004. The before count inventory was $3,482,178 and the after count inventory, as noted above, was $3,404,532. Thus, the "shrinkage" was $77,646, or 2.23 percent of the before inventory value.

The Budget Analyst performed counts of various inventoried items at six storage bin locations in the main storeroom in order to obtain an indication of the accuracy of the information contained in the computer records. The storage bin counts matched the information in the computer records on only three of the six counts, which compares unfavorably to the tests performed at the two other Water Enterprise Divisions and at the Water Pollution Control Division.

As previously stated, the Classification 1944 Materials Coordinator who heads the Materials Management staff has been on an extended absence in excess of one year. The permanent classification of the Acting Materials Coordinator is Classification 1934 Storekeeper. In response to inquiries concerning the $77,646 shrinkage between the before count inventory and after count inventory and the results of the storage bin count tests, the Acting Materials Coordinator and one of the storekeepers attributed the inventory reconciliation discrepancies to the following causes:

- Human Error: improper issues and returns.
- Human Error: inaccurate inventory counting.
- Warehouse access during non-regular duty hours.
- Unsecured inventory in the maintenance yard.

Currently, supervisors in need of material from the storeroom after regular duty hours obtain the key to the storeroom from the Communications Office and gain access. The supervisor is supposed to fill out an issue tag for any items removed from the storeroom; however, according to the storekeeper, that policy is not practiced, and there has not been an issue tag completed in the last two or three years. The Acting Materials Coordinator and his assistant offered the opinion that the most effective means of reducing items being taken from the storeroom and not recorded would be with a keycard system, whereby a record is made of everyone gaining entry during after duty hours.

Control of Tools and Equipment

The Water Supply and Treatment Division and the City Distribution Division do not have adequate inventory records of tools and equipment. In response to a Budget Analyst request for a copy of the most recent inventory of shop tools and equipment, the Water Supply and Treatment Division's reply was that each supervisor or foreman is responsible for his or her crews' tools and equipment, but that there had not been an organized inventory of such equipment in some time. The City Distribution Division's reply was that the date of the last inventory is unknown, a copy of the inventory results does not exist, and that the City Distribution Division would conduct an inventory by the end of the current fiscal year.

Tools and equipment of a specified value should be inventoried, formally tracked, and re-inventoried on an annual basis.

The Utility Plumber Apprenticeship Program

The Public Utilities Commission has 28 Classification 7463 Utility Plumber Apprentice positions in the FY 2004-2005 budget, of which 21 are allocated to the City Distribution Division and seven are allocated to the Water Supply and Treatment Division. The apprenticeship program is five years but can be extended without time limits. The City does not have a formal agreement with the labor organization, Plumbing and Pipefitting Industry Local No. 38, over the terms and conditions of the utility plumber apprentice program. The current Memorandum of Understanding between the City and the Plumbing and Pipefitting Industry Local No. 38, effective from July 1, 2003 through June 30, 2006, states that the City and the union agree to meet to discuss and develop an apprenticeship program. The apprenticeship program includes provisions (a) allowing the City to fill journey level positions with either journey level workers or apprentices as long as journey level to apprentice ratios established by the program are maintained, and (b) setting the apprentice entry level step at 40 percent less than the journey level wage rate.

Because the Public Utilities Commission's current practices in hiring and managing apprentices neither sets time limits for the length of the apprenticeship nor distributes apprentices proportionately to journey level workers across all operating sections, the apprenticeship program has resulted in staffing and operating inefficiencies. Therefore, the Public Utilities Commission should work in conjunction with the Director of Human Resources to establish a formal apprenticeship program agreement.

Conclusions

Water Supply and Treatment Division and City Distribution Division maintenance and materials management functions should be supported by written policies and procedures, and such policies and procedures should be fully implemented and monitored by Water Supply and Treatment Division and the City Distribution Division management. The written policies and procedures for maintenance management should include: (a) the setting of maintenance priorities, (b) procedures to control tools and equipment inventories, (c) recording maintenance time, (d) efficient use of the MAXIMO Computerized Maintenance Management System's capabilities, and (e) increasing "wrench time" or productive use of maintenance staff time.

The Water Supply and Treatment Division and the City Distribution Division should also adopt management by objectives, similar to those used by the Clean Water Enterprise, including setting standards for each of the objectives, adjusted for seasonal variations. The Water Supply and Treatment Division and the City Distribution Division should produce regular management by objectives reports to improve the performance of maintenance functions.

The maintenance performance measures developed by the Division Managers provide the basis for planning and controlling maintenance activities in order to optimize maintenance outputs. The performance measures provide a means of evaluating maintenance performance in an objective, quantifiable manner. Using the performance measures, the Divisions' management teams can set challenging but attainable goals in the pursuit of ultimate objectives.

The MAXIMO Computerized Maintenance Management Software system has extensive data collection and reporting capabilities, including backlog, planned work, and maintenance history data. The City Distribution Division does not effectively use the MAXIMO Computerized Maintenance Management System's capabilities. For example, the City Distribution Division uses MAXIMO minimally for planning maintenance work and not at all for scheduling. Given these capabilities, the Water Supply and Treatment Division's and the City Distribution Division's requests for maintenance resources should be accompanied by backlog, planned work, and maintenance history data.

Correction of these deficiencies would greatly enhance the two Divisions' efficiency and productivity. The Budget Analyst conservatively estimates that a 5 percent productivity improvement in both the Water Supply and Treatment Division's and the City Distribution Division's maintenance activities could be achieved. Such an improvement would benefit the Water Supply and Treatment Division by the equivalent of adding approximately seven additional positions, which would otherwise cost approximately $700,000 annually in base salaries and mandatory fringe benefits. A 5 percent productivity improvement in the City Distribution Division's maintenance activities would be the equivalent of approximately ten additional positions, which would otherwise cost approximately $1,000,000 annually in base salaries and mandatory fringe benefits. The City Distribution Division Manager should lead a Division-wide effort to improve controls over storeroom inventory.

Recommendations

The Water Supply and Treatment Division Manager should:

12.1 Establish a timeline for development of a Maintenance Management Policies and Procedures Manual and report on the status of the manual's development to the Assistant General Manager, Water prior to December 31, 2005.

12.2 Establish a timeline for development of a Materials Management Policies and Procedures Manual and report on the status of the manual's development to the Assistant General Manager, Water prior to December 31, 2005.

12.3 Ensure that the Water Supply and Treatment Division incorporates automated planning and scheduling processes into its everyday maintenance activities.

12.4 Ensure that the Water Supply and Treatment Division initiates maintenance reporting on a continuing, periodic basis. The *Management by Objectives Report* produced by the Water Pollution Control Division is a useful model.

12.5 Use MAXIMO reports when requesting maintenance resources.

12.6 Ensure that all tools and equipment are inventoried annually.

12.7 Direct a review of inventory items for the purpose of determining which items should be stocked regardless of demand history, which items should be retained in inventory but only reordered when there is a demand, and which items should be advertised for disposal.

12.8 Ensure that the material in the maintenance yard not currently in inventory be brought into inventory or reported for disposal.

12.9 Take necessary action to improve the physical condition of the warehouse, including ensuring that the leaking roof is repaired.

The City Distribution Division Manager should:

12.10 Fill the vacant maintenance manager and maintenance planner positions and ensure that the 7205 Chief Stationary Engineer is assigned to maintenance planning functions.

12.11 Compare the newly established MAXIMO performance measures for the City Distribution Division against measures proposed in American Water Works Association literature and the literature of other water associations, and incorporate additional and/or replacement performance measures as deemed appropriate.

12.12 Ensure the accuracy of the data collected and reported on actual performance.

12.13 Establish a timeline for development of the Maintenance Management Policies and Procedures Manual and report on the status of the manual's development to the Assistant General Manager, Water prior to December 31, 2005.

12.14 Establish a timeline for development of the Materials Management Policies and Procedures Manual and report on the status of the manual's development to the Assistant General Manager, Water prior to December 31, 2005.

12.15 Ensure that the City Distribution Division incorporates automated planning and scheduling processes into its everyday maintenance activities.

12.16 Ensure that the City Distribution Division initiates maintenance reporting on a continuing, periodic basis. The *Management by Objectives Report* produced by the Water Pollution Control Division is a useful model.

12.17 Use MAXIMO reports when deciding on resource allocations.

12.18 Ensure that all tools and equipment are inventoried annually.

12.19 Take necessary action to reduce shrinkage and improve the accuracy of the data contained in MAXIMO on material.

The Director of Human Resources should:

12.20 In accordance with the existing memorandum of understanding and in conjunction with appropriate officials of Plumbing and Pipefitting Industry Local No. 38 and the Public Utilities Commission, make every effort to establish an agreement between the City and Plumbing and Pipefitting Industry Local No. 38 on a Utility Plumber Apprentice Program.

Costs and Benefits

The Budget Analyst's recommendations can be accomplished with existing staff. Implementation of the Budget Analyst's recommendations would enhance the effectiveness and efficiency of the Water Supply and Treatment Division and the City Distribution Division's maintenance and material management functions.

The City Distribution Division can achieve significant benefits by improving the accuracy of its warehouse inventory, thereby providing better services to warehouse users, and by preserving funds through enhanced safeguarding of warehouse assets.

The Budget Analyst conservatively estimates that a 5 percent productivity improvement in the both Divisions' maintenance activities could be achieved. Such an improvement would benefit the Water Supply and Treatment Division by the equivalent of adding approximately seven additional positions, which would otherwise cost approximately $700,000 annually in base salaries and mandatory fringe benefits. A 5 percent productivity improvement in the City Distribution Division's maintenance activities would be the equivalent of approximately ten additional positions, which would otherwise cost approximately $1,000,000 annually in base salaries and mandatory fringe benefits.

The benefit of concluding a utility plumber apprentice agreement would be the ability to incorporate changes that better serve the interests of the City and the utility plumber apprentices.