



CITY OF BEVERLY HILLS
PUBLIC WORKS DEPARTMENT
MEMORANDUM

TO: PUBLIC WORKS COMMISSION

FROM: Trish Rhay, Assistant Director of Public Works
Caitlin Sims, Senior Management Analyst

DATE: October 13, 2016

SUBJECT: MANAGEMENT STUDY OF THE WATER SUPPLY AND DISTRIBUTION PROGRAM / WATER OPERATIONAL AUDIT

ATTACHMENTS:

1. Management Study of the Water Supply and Distribution Program Report
2. Implementation Schedule

At its January 5, 2016, meeting, the City Council directed staff to complete an organizational, operational, and financial assessment of the water utility prior to the adoption of new water rates. The Council wanted to ensure that the utility was operating as efficiently as possible prior to adopting new rates. At the May 12, 2016, Public Works Commission meeting, staff reported that Matrix Consulting Group ("Matrix") had been selected to complete this analysis.

Over the last five months, staff from Matrix Consulting Group ("Matrix") reviewed the policies and procedures of the water utility, including water operations, engineering, utility billing, and information technology and has met staff in the City's Water Utility, Public Works Department, Finance Department, Information Technology (IT) Department, Engineering Division and City Manager's Office. This information has been used to develop the "Management Study of the Water Supply and Distribution Program" for the City of Beverly Hills.

The report (Attachment 1) provides a profile and overall diagnostic appraisal of the water supply and distribution program. It also includes an analysis of the different elements of the water division, including the indirect cost allocation, asset management, engineering, staffing, geographic information systems ("GIS"), water resources, and utility billing. The Study includes an assessment of those services provided both within the Public Works Department, as well as those provided by other City departments.

Ultimately, the document includes a list of 136 recommendations to address the findings of the report and an associated implementation schedule (Attachment 2). The majority of the recommendations are specific recommendations related to water operations and improving long-term planning. There are no recommendations that will produce significant cost savings in the near-term; however, some operational improvements may improve long-term efficiency and, thus, produce long-term cost savings.

Gary Goelitz, from Matrix Consulting, will present on the report. Staff will also be available to answer any questions.

Next Steps

Following review by the Public Works Commission, the report will be presented to the City Council. Staff will receive further direction from the City Council at that time.

Attachment 1

**Management Study of the
Water Supply and Distribution Program
BEVERLY HILLS, CALIFORNIA**



October 2016

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1. INTRODUCTION AND EXECUTIVE SUMMARY

This first chapter introduces the analysis – outlining principal objectives and how the analysis was conducted – and presents an executive summary. The analysis was based upon data collected by the Matrix Consulting Group beginning in May 2016.

1. SCOPE AND OBJECTIVES OF THE MANAGEMENT STUDY

The City is in the process of re-evaluating and potentially revising its current rate structure. However, before the City Council will consider a new structure, it directed staff to evaluate the City water department's operations and organization to ensure that it is being operating as efficiently and cost-effectively as possible. The findings of the operations, organization and financial study will be utilized to complete the rate structure evaluation.

The study was to focus on two tasks:

- **Analysis of the organizational/operational efficiency and effectiveness of the water utility** including (1) reviewing its current organizational structure and assess services provided by other City departments; and (2) evaluating whether there are informative job descriptions, optimized staffing levels and positions with respect to workload and overtime, appropriate span of management and supervisory oversight, an internal environment that develops future management, and appropriate succession planning efforts; (3) evaluating current operations including the operation of the water supply, treatment, and distribution system, operation of the water utilities' services, including meter reading, meter maintenance, leak detection services, billing, collections, and customer service; (4) evaluating customer experience and overall customer value, and benchmark against industry best practices and against other comparable agencies to evaluate current performance; and
- **Analysis of financial conditions and planning, and reporting** including (1) analyzing historical and current financial performance, providing recommendations to improve the City's financial structure to ensure sustainability. Issues (2) assessing water enterprise fund costs and revenues and evaluate cost of service; (3) analyzing the allocation of costs to various functions of the water systems for appropriateness; (4) Identifying all water enterprise fund revenues; (5) Identifying and assessing the appropriateness of Internal Service Fund charges and other allocations to the water fund (i.e. allocation of space,

etc.); (6) and evaluating all direct and indirect costs and revenues related to the water fund to ensure they're accounted for appropriately.

In addition, the Public Works Commission requested that the Matrix Consulting Group document the impact of previous policy decisions on the costs of operations, maintenance, and capital improvements on the Water Supply and Distribution Program.

The Matrix Consulting Group was retained to conduct a comprehensive organization and management evaluation of the Water Supply and Distribution Program's existing operations, service levels, infrastructure management, and staffing levels. The analysis was fact based and included all aspects of services provided by the Program and services provided by other departments to the Program (e.g., engineering, utility billing, etc.).

The scope of the operations review was comprehensive. It included the following issues:

- Developing an Understanding of Water Enterprise Fund Operations, Expenditures and Revenues, and Service Levels;
- Benchmarking the Water Enterprise Fund to Those of Other Utilities and to "Best Management Practices";
- Evaluating Water Utility Staffing, Work Practices, and Service Levels;
- Analyzing the Indirect Costs Allocated to the Water Enterprise Fund by Other Divisions and Departments; and
- Evaluating the Plan of Organization.

The objective of this assessment was to identify opportunities for improvement in the operational and economic efficiency of the Water Supply and Distribution Program and practical opportunities for enhancing the quality of its product and services.

2. PROJECT METHODOLOGIES

The Matrix Consulting Group utilized a fact-driven data collection and analytical process in conducting the operations review of the Water Supply and Distribution Program. The methodologies are summarized below.

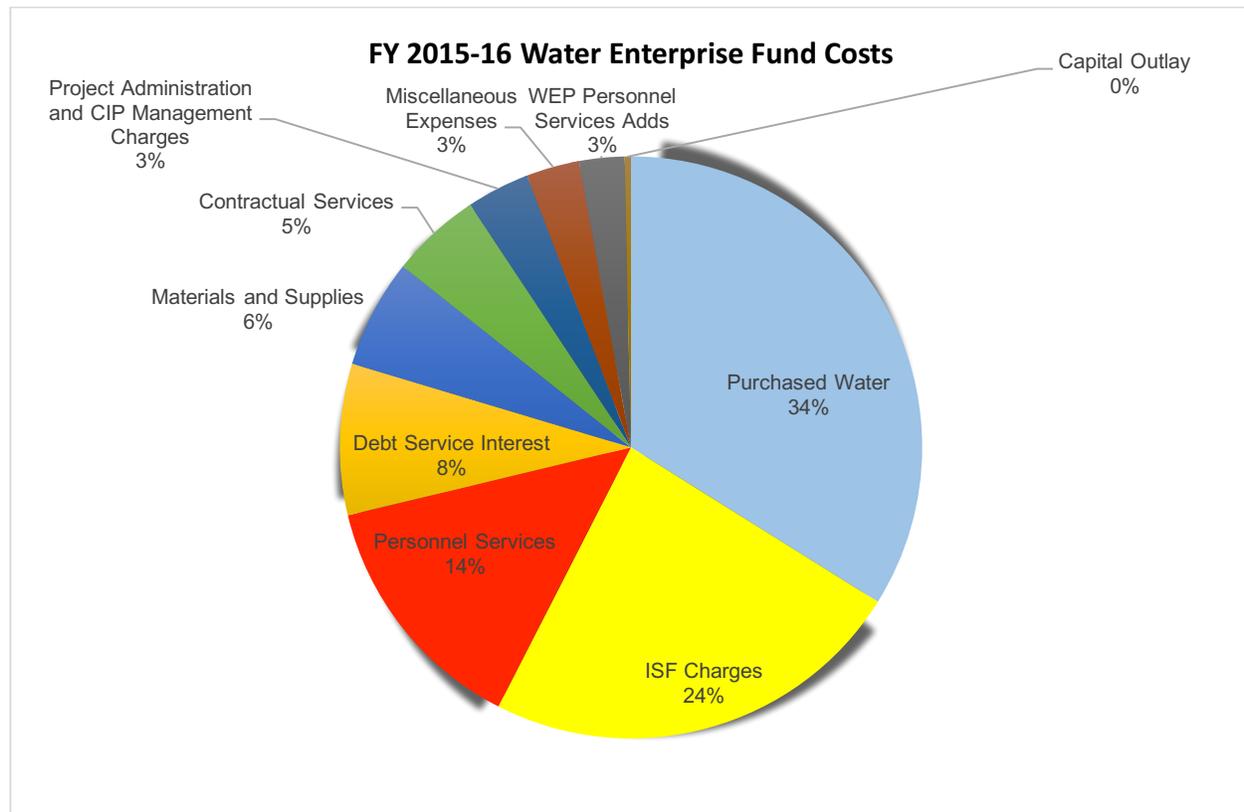
- The Matrix Consulting Group conducted preliminary data collection for the operations review to ensure a clear understanding by the Water Supply and Distribution Program of the scope of the project, obtained the views and perspectives at all levels of the department, and obtained an initial understanding of the Program including mission, goals, objectives, business processes, service level targets, performance indicators, and initial issues and opportunities for improvement.
- The Matrix Consulting Group conducted interviews at all levels of the organization of the Water Supply and Distribution Program. The purpose of these interviews was to develop a detailed understanding of the Program including how services are delivered, staffed, managed, and the costs associated with the delivery of those services.
- The Matrix Consulting Group collected data regarding service delivery by the Water Supply and Distribution Program including organization of services, the structure and functions of the Program, budgets, workload data, management systems, inventory of the infrastructure, etc.
- The Matrix Consulting Group compared the practices and programs of the Water Supply and Distribution Program to the American Water Works Association, other local water utilities, and the experience of the Matrix Consulting Group.

The following section provides examples of the strengths of the Water Supply and Distribution Program.

3. THE WATER SUPPLY AND DISTRIBUTION PROGRAM WAS A \$30.4 MILLION BUSINESS IN FISCAL YEAR 2015-16.

There are 482 incorporated cities in California, and 285 of those (59%) own and operate their own water utilities. Altogether, cities in California provide water service to almost 20 million Californians, slightly more than half of all state residents.

In fiscal year 2015-16, the City of Beverly Hills was budgeted to expend \$30.4 million in the supply and distribution of water to its customers (as of January 2016). The allocation of costs by category are presented in the chart below.¹



Important points to note regarding the chart are presented below.

- Water purchased from the Metropolitan Water District represents the single largest projected cost for the Water Enterprise Fund in 2015-16: 34% of the total costs. The cost amounted to \$10.3 million, including a reduction for conservation that was included in the HF & H rate study. The Metropolitan Water District provides wholesale water service to its 26 member agencies, including Beverly Hills, in a six-county area.
- Internal Service Fund charges were the second largest projected cost for the for the Water Enterprise Fund in 2015-16: 24% of the total costs. These Internal Service Fund charges include internal services provided to the Water Enterprise Fund (e.g., building maintenance, vehicle maintenance, utility billing and cashing, information technology, etc.) and citywide overhead (e.g., legal

¹ Source of the costs: Administrative Services Department, City of Beverly Hills, California

services, citywide policy and management, human resources, Public Works Department administration, etc.).

- Personnel services were the third largest projected cost for the for the Water Enterprise Find in 2015-16: 14% of the total costs.
- Debt service interest was the fourth largest projected cost for the for the Water Enterprise Find in 2015-16: 8% of the total costs.
- Materials and supplies were the fifth largest projected cost for the for the Water Enterprise Find in 2015-16: 6% of the total costs.

Altogether, these five different categories accounted for almost 86% of the total projected costs of the Water Enterprise Fund in 2015-16.

4. THE CITY’S WATER CONSERVATION PROGRAM HAS RESULTED IN A REDUCTION OF ACRE FEET WATER USED BY THE CUSTOMERS OF THE WATER SUPPLY AND DISTRIBUTION PROGRAM.

The City of Beverly Hills is mandated to reduce water consumption. In April 2015, Governor Brown issued Executive Order B-29-15 declaring a continuing State of Emergency regarding California’s water supply.

The table below presents the metered gallons of water consumed by customers of the Water Supply and Distribution Program since January 2012.

Month	2012	2013	2014	2015	2016
January	810.5	717.6	865.5	769.7	638.8
February	717.7	669.2	736.8	775.8	663.6
March	852.5	821.7	781.4	895.9	706.9
April	842.7	962.9	929.0	920.8	742.0
May	962.8	1,047.3	1,155.9	869.6	798.7
June	969.2	1,020.8	1,038.6	841.7	862.6
July	1,031.3	1,185.5	1,210.6	929.0	932.3
August	1,207.5	1,184.4	1,169.6	976.6	
September	1,138.6	1,060.6	1,089.9	918.5	
October	984.3	1,006.1	1,037.5	897.4	
November	892.0	865.7	878.7	814.7	
December	621.0	822.5	632.2	779.3	
TOTAL	13,042.1	13,377.3	13,539.7	12,404.0	7,360.9

The water consumed by customers of the Water Supply and Distribution Program decreased by 8.4% in 2015 versus 2014. In the first seven months of 2016, the water consumed by customers of the Water Supply and Distribution Program decreased another 11% versus 2015, although water consumed in June and July 2016 exceeded the same months in 2015.

The reduction in the amount of water consumed by customers has obvious implications for the unit costs of water sold in the City. While the cost of purchased water decreases, other fixed costs, such as debt service, remain the same.

Other cities are grappling with this same problem. For example:

- Santa Barbara. Santa Barbara is proposing rate increases in 2017 that range from 9% for low usage levels to 36% for high usage levels. The proposed water rates are not anticipated to cover all of the projected costs. To minimize water bill increases, the City plans to use approximately \$5 million in reserves to make up the difference between revenue generated and the cost for service, and will postpone capital projects that can be delayed.
- Pasadena. The City of Pasadena has been saving an estimated 21% water in drought mitigation efforts, and that has translated in to a net revenue loss over the last year. The City Council approved an increase in water rates which will result in an average estimated 10% to 11% increase.
- Santa Monica. The City of Santa Monica is implementing a 41% water rate increase for 2015 through 2019 in 9% annual increments (the 9% increment in 2016 was reduced to 5%).

In comparison, the water rate study completed for the City of Beverly Hills by HF & H Consultants in December 2015 recommended a 19.2% increase in service charges to generate sufficient revenue given the estimated reduction in the demand for water.

Cities in California, including Beverly Hills, are faced with the difficulty of meeting State requirements for water conservation, which will reduce revenue, while at the same time funding the ongoing operating and capital costs associated with their water utilities.

5. THE MANAGEMENT STUDY OF THE WATER SUPPLY AND DISTRIBUTION PROGRAM CONSIDERED THE TEN ATTRIBUTES OF AN EFFECTIVELY MANAGED WATER UTILITY.

In June 2008, the United States Environmental Protection Agency and six national water and wastewater professional associations (including the American Water Works Association) published *Effective Utility Management, a Primer for Water and Wastewater Utilities*.² The publication included ten attributes of effectively managed water utilities.

The attributes provide a useful and concise reference point for the improvement of the performance of a water utility. The attributes describe desired outcomes related to operations, infrastructure, customer satisfaction, community welfare, natural resource stewardship, and financial performance.

The ten attributes are summarized below.

- **Water Quality.** Produce potable water in full compliance with any regulatory and reliability requirements.
- **Customer Satisfaction.** Provide reliable, responsive, and affordable service in line with explicit customer-accepted service levels.
- **Employee, Supervisory, and Management Development.** Strive to recruit and retain competent, motivated, adaptive, and safe employees, supervisors, and managers.
- **Operational Optimization.** Ensure all facets of utility operations are optimized (timely, cost-effective, reliable, and sustainable performance).
- **Financial Viability.** Maintain a water utility that is financially viable (establish and maintain an effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenues, considering short and long-term needs).

² Effective Utility Management: A Primer for Water and Wastewater Utilities, American Water Works Association, June 2008

- **Infrastructure Viability.** Maintain a stable infrastructure and know the condition of all water utility assets (maintain and enhance the condition of water utility assets over the long-term at the lowest possible life-cycle cost and acceptable risk).
- **Operational Resiliency.** Provide leadership to anticipate and avoid problems, effectively managing risks (legal, regulatory, financial, environmental, safety, security, and emergency).
- **Community Sustainability.** Manages operations, infrastructure, and investments to protect, restore, and enhance the natural environment; efficiently use water and energy resources; promote economic vitality; and engender overall community improvement.
- **Water Resource Adequacy.** Ensures water availability consistent with current and future customer needs through long-term resource supply and demand analysis, conservation, and public education.
- **Stakeholder Understanding and Support.** Engenders understanding and support from the Public Works Commission, the community, and regulatory bodies for service levels, rate structures, operating budgets, capital improvement programs, and risk management decisions.

As the following section indicates, the Water Supply and Distribution Program has a number of strengths, considering these ten attributes.

6. THE WATER SUPPLY AND DISTRIBUTION PROGRAM EMPLOYS A NUMBER OF BEST PRACTICES.

An organizational and management analysis, by its nature, focuses on opportunities for improvement. However, there are a number of strengths in the Water Supply and Distribution Program. Examples of these strengths are portrayed below.

- The Assistant Public Works Director has created a resource forecasting spreadsheet to forecast staffing needs. The spreadsheet identified crew sizes and time by task. This spreadsheet will form the foundation for determining staffing needs by time period. The spreadsheet was populated by going through each activity to determine (1) the list of activities (2) number of labor hours on average for the activity (3) crew sizes (4) how many activities are done in a year (5) when the activities are typically done.
- Employees of the Water Supply and Distribution Program hold appropriate State certification.

- A water supply distribution master plan was developed, in 2002, that identified needed infrastructure replacement requirements over the next five to ten years.
- All conceptual planning, design and construction for capital projects for the Water Supply and Distribution Program is outsourced to consulting engineers.
- The Consumer Confidence Reports indicate that the City meets or betters water quality standards, with only one of the approximately 1,400 samples indicating a positive total coliform fecal bacteria result last year. Water Quality monitors water quality on a daily basis for low chlorine residuals, nitrification, and to ensure that bacteria levels are within expected ranges.
- Customers can view their potable water consumption in real time if they sign up for Water Tracker on line.
- The Water Supply and Distribution Program maintains a Permalog Leak Detection devices. The devices record sustained sounds or vibrations that may be caused by water seeping from the system and automatically alerts the Program regarding potential leaks.
- Based upon the data provided by Public Works GIS, it appears as if the rate of water main breaks was approximately 11.7 breaks per 100 miles of main in 2014 and 8.2 per 100 miles of main in 2015. The rate of main breaks per 100 miles of main in 2014 reflects is typical for water utilities, while the rate in 2015 is 25% less than typical.³
- The Water Supply and Distribution Program has developed and installed a comprehensive water conservation program. For example, customers can view their real time consumption if they sign up for Water Tracker on line. As another example, when multi-family homes are sold, they must have water conserving toilets, sinks and other fixtures retrofitted.
- An alarm system is in place for illegal entry of water pumping stations and water tanks.
- The staff of the Water Supply and Distribution Program participate in the City's annual emergency planning drills, including the specific action plans that will be used to respond to events and incidents.

These are examples of the strengths of the Water Supply and Distribution Program.

³ Water Main Breaks in the USA and Canada: A Comprehensive Study, Utah State Buried Structures Laboratory, Steve Foilkman, Ph.D., P.E., April 2012.

7. ELEVEN POINT AGENDA FOR CHANGE

The assessment of the Water Supply and Distribution Program identified over 130 recommendations for improvement that the Matrix Consulting Group believes should provide the basis for change in the Water Supply and Distribution Program in the coming years. These recommendations fall into a number major improvement areas which are briefly summarized below.

- **Indirect Cost Allocation.** The City's current cost allocation model functions effectively to allocate indirect costs among the City's various funds. However, the cost of purchased water should be excluded from the budget allocation metrics in the City's cost allocation model. This is the same approach that the Matrix Consulting Group makes in the development of cost allocation plans for other cities with municipal water utilities such as Pasadena, Manhattan Beach, and Long Beach. However, before the Administrative Services Department makes this adjustment, the Administrative Services Department should report back to the Office of the City Manager and the City Council regarding the implications of this adjustment to other funds. Clearly, if the allocation of indirect costs is reduced for the Water Enterprise Fund, the allocation of costs will need to be increased for other funds to compensate for that reduction.
- **Asset Management.** The City should establish an Asset Management Office within the Public Works Department. The intent of the Asset Management Office is to ensure consistency in asset management practices throughout the Public Works Department through policies, frameworks, templates and standard tools (e.g. level of services such as preventive maintenance, asset management plan templates, risk management tools, etc.), and to provide coordination in the re-optimization of the Hansen computerized maintenance management system. Two Planner and Scheduler positions should be authorized once the Hansen computerized maintenance management system is re-optimized to plan and schedule the work of field operations within the Public Works Department (streets, wastewater, traffic signals, water, etc.), update the asset registry for the department, etc.
- **Hansen Computerized Maintenance Management System.** The Public Works Department should proceed forward with the re-optimization of the Hansen computerized maintenance management system. This system should be utilized to enable the identification of the services provided (e.g., water supply and distribution system preventive maintenance), the levels of service (e.g., 100% of the water distribution valves 16" and larger are exercised annually), the outputs of each of these services (e.g., the number of water distribution valves exercised

per crew day), and the costs of those service in terms of the total cost and the cost per unit of output.

- **Preventive Maintenance of the Water Supply and Distribution Program.** The Water Supply and Distribution Program needs to improve some aspects of the preventive maintenance of assets entrusted to its care.
- **Capital Projects Management.** The Public Works Department should enhance the effectiveness of its capital project management practices so that these projects can be designed and built in a timely and cost-effective manner.
- **Staffing of the Water Supply and Distribution Program.** Overall, the number of authorized positions allocated for the maintenance and repair of the water distribution system in Beverly Hills are comparable to Glendale, Pasadena, Santa Monica, and Torrance, but somewhat more than Burbank and Manhattan Beach, when considering the number of authorized positions per 100 miles of water mains. However, the Water Supply and Distribution Program should focus its scarce and valuable staff resources on the delivery of core services as recommended within the body of the report, and should improve the management of overtime by staff assigned to the Program.
- **Geographic Information Systems (GIS).** The Public Works Department should complete the asset registry for the Water Supply and Distribution Program this fiscal year. The Information Technology Department should develop formal governance systems for citywide GIS. The Public Works Department should more effectively utilize the standard tools available from ESRI for GIS.
- **Water Resources.** The Water Supply and Distribution Program should report its progress in accomplishing the recommendations contained in the Water Enterprise Plan to the Public Works Commission on an annual basis. The Civil Engineer position in the Building and Safety Division should continue to be assigned responsibility for development review on behalf of the Public Works Department and relieve the Water Resources Manager of development-related workload. Given the capital project workload associated with the Water Supply and Distribution Program, including the implementation of the Water Enterprise Plan, the two Project Managers positions in the Engineering Division funded by the Water Enterprise Fund should be assigned to Water Supply and Distribution Program capital projects on a full-time basis.
- **Utility Billing.** The Administrative Services Department should develop a proposal for the consideration of the City Council regarding the costs and benefits of the conversion of water utility billing from bi-monthly billing to monthly billing. The Administrative Services Department should acquire web interface commercial off the shelf software to enable electronic billing, payment, and communication with utility customers. The Water Supply and Distribution

Program and the Administrative Services Department should reduce the extent of meter re-reads.

- **Real Property.** The Public Works Department should conduct a market-based rent analysis of three properties - 333 South La Cienega Boulevard, the West Hollywood pipe yard, and the Public Works facility at 345 North Rexford - and develop recommendations regarding the rent that should be paid by the General Fund to the Water Enterprise Fund for these three properties that reflects their market-based rent, given the current conditions of the property. In addition, the Department should develop recommendations regarding the appropriate market-based rent that should be provided by the Water Enterprise Fund to the General Fund for properties “owned” by the General Fund, but used by the Water Enterprise Fund for water storage tanks.
- **Plan of Organization for the Water Supply and Distribution Program.** Upon the retirement of the Water Operations Manager, the Water Resources Manager position should be assigned responsibility for managing the Water Supply and Distribution Program. The vacant Water Operations Manager position should be reclassified within the civil engineering series and, under the supervision of the Water Resources Manager position, utilized to coordinate the implementation of the Water Enterprise Plan. The Civil Engineering GIS Specialist should be transferred from the Public Works Department to the Information Technology Department, but continue to be physically based in the Public Works Department administration building and continue to be assigned to GIS.

These represent the significant opportunities for improvement in the Water Supply and Distribution Program.

8. SUMMARY OF RECOMMENDATIONS

The following table provides an encapsulated summary of recommendations contained within the report. These recommendations will serve as the basis for a multi-year implementation program by the City. A multiple number of years will be required to implement the recommendations given the necessity for development of new management systems, the re-optimization of the Hansen computerized maintenance management system, changes in work practices, negotiations with employee associations, etc.

Prior to the implementation of this study, the Matrix Consulting Group suggests that the City take the actions noted below.

Recommendation #1: The management study of the Water Supply and Distribution Program should be distributed to the relevant departmental directors, managers and supervisors of the City that are involved in the Program for review and input.

Recommendation #2: The Public Works Director, Assistant Public Works Director – Infrastructure and Field Operations, Finance Director, Information technology Director, and City Engineer should review the proposed plan of implementation and the summary of recommendations in this report with these managers and supervisors of the City that are involved in the Program, modify the plan of implementation as appropriate, and submit the revised plan of implementation to the Office of the City Manager.

Recommendation #3: After acceptance of the report and the implementation plan by the Office of the City Manager, a semi-annual status report outlining implementation progress should be provided to the Office of the City Manager by the Assistant Public Works Director – Infrastructure and Field Operations.

Summary of Recommendations

#	Recommendation	Priority	Schedule	Responsibility
Chapter 1 - Introduction and Executive Summary				
1	The management study of the Water Supply and Distribution Program should be distributed to the relevant departmental directors, managers and supervisors of the City that are involved in the Program for review and input.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
2	The Public Works Director, Assistant Public Works Director – Infrastructure and Field Operations, Finance Director, Information technology Director, and City Engineer should review the proposed plan of implementation and the summary of recommendations in this report with these managers and supervisors of the City that are involved in the Program, modify the plan of implementation as appropriate, and submit the revised plan of implementation to the Office of the City Manager.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
3	After acceptance of the report and the implementation plan by the Office of the City Manager, a semi-annual status report outlining implementation progress should be provided to the Office of the City Manager by the Assistant Public Works Director – Infrastructure and Field Operations.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
Chapter 4 - Analysis of Indirect Cost Allocation				
4	The City should either update its cost allocation plan manual to reflect how costs are being allocated in the cost allocation model, or alter the methodology used in the model to reflect the description currently shown in the manual.	Medium	2017	Director of Administrative Services & Chief Financial Officer
5	The cost of purchased water should be excluded from the City’s budget allocation metrics in the City’s cost allocation model. However, before the Administrative Services Department makes this adjustment excluding the cost of purchased water from the City’s budget allocation metrics in the City’s cost allocation model, the Administrative Services Department should report back to the Office of the City Manager and the City Council regarding the implications of this adjustment to other funds. Clearly, if the allocation of indirect costs is reduced for the Water Enterprise Fund, the allocation of costs will need to be increased for other funds to compensate for that reduction.	High	2017	Director of Administrative Services & Chief Financial Officer

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Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
Chapter 5 - Analysis of Asset Management				
6	The Public Works Department should develop an asset management policy and procedure for the consideration of the Office of the City Manager, Mayor and City Council.	High	2017	Deputy Director of Public Works - Operational Support
7	In the development of an asset management policy and procedure, the Public Works Department should clarify accountability for the management of each of the assets under its stewardship.	High	2017	Deputy Director of Public Works - Operational Support
8	The Public Works Department should establish a departmental asset management committee to facilitate a coordinated departmental asset management approach.	High	2017	Deputy Director of Public Works - Operational Support
9	The Public Works Department should designate the managers within the department that are accountable for managing each specific type of asset assigned to the stewardship of the Department. Each asset manager should be responsible for the development of an asset management strategy and plan for those assets assigned to their management.	High	2017	Deputy Director of Public Works - Operational Support
10	The City should establish an Asset Management Office within the Public Works Department. The Asset Management Office should be incorporated in the Operational Support Division of the department.	High	2017	Deputy Director of Public Works - Operational Support
11	The Asset Management Office, Public Works Department should provide a support function to all divisions in the Department providing a clear asset management policy and asset management strategy, common standards (including tools and templates), ensuring consistency in delivery and reporting and ongoing support to departmental asset managers.	High	2017	Deputy Director of Public Works - Operational Support

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Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
12	<p>The Asset Management Office, Public Works Department should be expected, initially, to (1) Manage the implementation of GIS in the Public Works Department working with the Information Technology Department; (2) Manage the implementation of the Hansen computerized maintenance management system working with the Information Technology Department; (3) Develop and populate levels of service at the asset level with supporting metrics that provides clear levels of service to guide decision-making (e.g., testing the registration accuracy of commercial meters in accordance with American Water Works Association guidelines); (4) Working with the asset managers in the Public Works Department, develop asset management plans by type of asset to provide guidance for asset management activities, propose the maintenance, repair, and replacement strategies for each type of asset, and document the financial implications of the strategies; (5) Establish a standardized methodology for condition assessments of assets including guidelines and frameworks; (6) Establish asset management procedures and standard guidelines; (7) Develop a comprehensive maintenance management system for the assets assigned to the stewardship of the Public Works Department; (8) Develop and implement asset management reporting strategies and policies.</p>	High	2017	Deputy Director of Public Works - Operational Support
13	<p>Four positions within the Public Works Department should be allocated to the Asset Management Office. These include: (1) the Civil Engineering GIS Specialist and any of the temporary GIS staff resources allocated to GIS within the Public Works Department; (2) the GIS Integrator (this position is budgeted in the Information Technology Department, but the coordination between the Public Works Department and the Information Technology Department should be provided through the Asset Management Office); (3) the Systems Integrator (the overall coordination of the Systems Integrator position would be provided by the Deputy Director of Public Works Services - Operational Support, but the position should work within the Asset Management Office in the implementation of the Hansen computerized maintenance management system and its integration with other information systems such as Munis); (4) the Planning and Research Analyst in Public Works Administration responsible for working with departmental managers, supervisors and the Systems Integrator to implement the Hansen computerized maintenance management system.</p>	High	2017	Deputy Director of Public Works - Operational Support

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#	Recommendation	Priority	Schedule	Responsibility
14	In addition, in the longer-term, as the Hansen computerized maintenance management system is re-optimized, two Planner and Scheduler positions should be authorized for the Public Works Department within the Asset Management Office to plan and schedule the work of the various field operations staff within the department, to update the asset registry, to facilitate condition assessments, etc.	Medium	2019	Deputy Director of Public Works - Operational Support
15	The Asset Management Office, Public Works Department should coordinate and lead the collection of asset inventory data for each of the assets assigned to the Public Works Department for maintenance and repair.	High	2017	Deputy Director of Public Works - Operational Support
16	The Asset Management Office, Public Works Department should coordinate the updating of the asset inventory data on an ongoing basis.	High	2017	Deputy Director of Public Works - Operational Support
17	The responsibility for updating of the asset inventory information should be assigned to each asset manager within the Public Works Department in a written policy and procedure.	High	2017	Deputy Director of Public Works - Operational Support
18	The Asset Management Office, Public Works Department should develop a written departmental policy and procedure regarding the updating of the asset inventory on an ongoing basis.	High	2017	Deputy Director of Public Works - Operational Support
19	The Asset Management Office, Public Works Department should conduct periodic asset condition assessments of the assets under the stewardship of the Public Works Department.	Medium	2019	Deputy Director of Public Works - Operational Support
20	The Asset Management Office, Public Works Department should prepare a five-year plan for the renewal and replacement of the assets assigned to the Department's stewardship. These long-term plans for the renewal and replacement of assets should be developed for the water supply and distribution system, storm water collection system, sanitary sewer collection system, traffic signal system, regulatory signs, etc.	Medium	2019	Deputy Director of Public Works - Operational Support
21	The five-term plans for the renewal and replacement of the assets assigned to the Department's stewardship should be prepared by the Asset Management Office with the advice and consultation of the asset managers.	Medium	2019	Deputy Director of Public Works - Operational Support
22	The Asset Management Office, Public Works Department should report annually on the progress of the Department in implementation of effective asset management practices.	Medium	2020	Deputy Director of Public Works - Operational Support
23	The annual asset management report should report progress in implementation of the infrastructure master plans (e.g., water supply and distribution master plan).	Medium	2020	Deputy Director of Public Works - Operational Support
24	The Public Works Department should develop an infrastructure report card and assessment that provides an evaluation of the state of the City's assets. The report card should be included in the 5-year capital improvement program budget.	Low	2020	Deputy Director of Public Works - Operational Support

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
Chapter 6 - Analysis of Maintenance Management				
25	The Asset Management Office should collect and enter asset data for those assets entrusted to its care into the GIS geodatabase and sync the geodatabase with the asset registry of the Hansen computerized maintenance management system asset management module on a phased-in basis.	High	2017	Deputy Director of Public Works - Operational Support
26	The Asset Management Office should begin with those types of assets that have already been inventoried and utilize those types of assets for the initial syncing with the asset registry of the Hansen computerized maintenance management system.	High	2017	Deputy Director of Public Works - Operational Support
27	Before beginning the initial asset inventory, the Department should develop a plan for how to sync the data within GIS initially and on an ongoing basis.	High	2017	Deputy Director of Public Works - Operational Support
28	The Asset Management Office should utilize the inventory data collection tools developed by ESRI for water supply and distribution, street signs, traffic signals, streetlight, bridges and sidewalks, etc.	Medium	2018	Deputy Director of Public Works - Operational Support
29	The Public Works Department should work with the Information Technology Department to install the Hansen computerized maintenance management system Customer Relationship Management module.	High	2018	Deputy Director of Public Works - Operational Support
30	The existence of the Hansen computerized maintenance management system Customer Relationship Management module should be noticed in the City's newsletter when the feature is available.	Low	2018	Deputy Director of Public Works - Operational Support
31	The Field Services Supervisor and the Water System Production / Operations Supervisor should not assign work to their staff without the creation of work orders, and the planning and scheduling of work orders.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
32	The Asset Management Office should develop and adopt policies and procedures that require the creation and completion of work orders for any work assigned to the staff of the Program.	High	2018	Deputy Director of Public Works - Operational Support
33	The Field Services Supervisor and the Water System Production / Operations Supervisor in the Public Works Department should review and verify the completeness and the validity of the data in each work order prior to closure of each work order in the Hansen Work Order / Maintenance Management module. This should be accomplished the same day as the work associated with the work order is completed.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
34	The Field Operations and Infrastructure staff of the Public Works Department should periodically be provided with training in the use of the Hansen Work Order / Maintenance Management module.	High	2019	Deputy Director of Public Works - Operational Support
35	The Asset Management Office should develop a formal written policy and procedure regarding the review of work orders for validity of the data and the completeness by the first line supervisor.	High	2018	Deputy Director of Public Works - Operational Support

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#	Recommendation	Priority	Schedule	Responsibility
36	All of the materials used by the crews in their maintenance and repair work should be entered into work orders in the Hansen Work Order / Maintenance Management module.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
37	The Asset Management Office should complete written policies and procedures regarding the day-to-day use of Hansen by the staff of the Department.	High	2018	Deputy Director of Public Works - Operational Support
38	The Asset Management Office should provide the staff of the Public Works Department with copies of the policies and procedures, provide training in their use and application, and provide the opportunity to answer questions. The Public Works Director, Assistant Directors, and the middle managers of the Department should then hold the staff accountable for compliance.	High	2018	Deputy Director of Public Works - Operational Support
39	The Public Works Department should “go live” with the Hansen Inventory Manager module, with the complete deployment of the module to record equipment and materials.	High	2018	Deputy Director of Public Works - Operational Support
40	The Asset Management Office should work with the first-line supervisors of the Department to define the work activities including the activity, the activity description, and the unit of measure.	High	2018	Deputy Director of Public Works - Operational Support
41	The Asset Management Office should work with the first-line supervisors of the Department to define the service level standards for the work activities performed by the Department.	High	2018	Deputy Director of Public Works - Operational Support
42	The Asset Management Office should work with the first-line supervisors of the Department to develop activity guides for the work activities performed by the Department.	High	2018	Deputy Director of Public Works - Operational Support
43	The Asset Management Office should work with the first-line supervisors of the Department and with the Information Technology Department to develop an annual work program for each section and division within the Public Works Department that uses the Hansen computerized maintenance management system, and to develop reporting systems to report budget to actual.	High	2018	Deputy Director of Public Works - Operational Support
44	The Asset Management Office within the Public Works Department should work with the first-line supervisors of the Department and the Information Technology Department to develop and deploy formal work planning and scheduling systems using the Hansen computerized maintenance management system.	High	2018	Deputy Director of Public Works - Operational Support
45	The Asset Management Office, Public Works Department should develop a formal written policy and procedure that provides guidelines for the priorities to be assigned by managers and supervisors to work activities.	High	2018	Deputy Director of Public Works - Operational Support

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#	Recommendation	Priority	Schedule	Responsibility
46	Preventive maintenance should be assigned a higher priority than all other work activities other than emergency repairs.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
47	The Asset Management Office, Public Works Department should revise the work order used by the Water Supply and Distribution Program to include a standard activity definition (e.g., exercise <16” distribution valves), the priority of the work, the performance measure for the number of units completed (e.g., the number of <16” distribution valves that were exercised), a category definition for the work activity (e.g., scheduled maintenance, preventive maintenance, scheduled corrective maintenance, unscheduled corrective maintenance, etc.).	High	2019	Deputy Director of Public Works - Operational Support
48	The Asset Management Office within the Public Works Department should work with the first-line supervisors of the Department and with the Information Technology Department to develop and deploy a monthly performance report comparing planned versus actual performance and costs. This monthly report should be developed using Hansen computerized maintenance management system.	High	2018	Deputy Director of Public Works - Operational Support
49	The Deputy Director of Public Works - Operational Support should work with the Information Technology Department to develop a budget proposal for fiscal year 2017-18 to acquire and deploy laptops sufficient for all of the vehicles used every day by the crews of the Department.	Medium	2017	Deputy Director of Public Works - Operational Support
50	The Public Works Department should establish a Steering Committee to provide governance for implementation of the Hansen computerized maintenance management system in the Department.	High	2017	Deputy Director of Public Works - Operational Support
51	The Asset Management Office should be assigned responsibility for coordination of the ongoing organization, establishment, and installation of the Hansen computerized maintenance management system and the associated maintenance management system in support of the steering committee.	High	2017	Deputy Director of Public Works - Operational Support
52	The Public Works Department should appoint division liaisons for the installation of the Hansen computerized maintenance management system and the maintenance management system.	Medium	2017	Deputy Director of Public Works - Operational Support

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
53	The City should retain TruePoint to assist in the re-implementation and optimization support of the Hansen for the first phase. That phase includes Enterprise GIS and Engineering Division GIS, wastewater (storm and sewer), water, Facilities Services, warehouse, and customer service. The one-time cost for this assistance would approximate \$443,705.	High	2017	Deputy Director of Public Works - Operational Support
54	Subsequently, the Public Works Department should proceed on its own with the re-implementation and optimization of the Hansen computerized maintenance management system based upon the support of the Asset Management Office and the Information Technology Department. It should also place TruePoint on retainer to assist the City in subsequent phases of re-implementation and optimization of the Hansen computerized maintenance management system as necessary.	High	2018	Deputy Director of Public Works - Operational Support
55	As necessary, the City should utilize limited-term positions within the Information Technology Department to assist with the re-implementation and optimization of the Hansen computerized maintenance management system subsequent to the first phase.	High	2018	Deputy Director of Public Works - Operational Support
Chapter 7 - Analysis of Preventive Maintenance				
56	The Water Supply and Distribution Program should initiate a predictive testing and inspection program for critical mechanical water assets utilizing contractors.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
57	The Water Supply and Distribution Program should preventively maintain fire hydrants on an annual basis removing the gate cap for the associated hydrant isolation valve, shutting the hydrant off, opening the ports to ensure the gate is working, greasing and lubricating the fire hydrant stem if needed, turning the hydrant on, taking a pressure reading, and painting the hydrant and gate cap.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
58	The Water Supply and Distribution Program should preventively maintain air release valves on an annual basis opening and flushing, inspecting for leakage, and replacing the resilient seats as necessary.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
59	The Water Supply and Distribution Program should preventively maintain cla-valves on an annual basis by exercising the valves, painting the valves, flushing of all the plumbing and confirmation of proper operation, and recording of upstream and downstream pressures.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

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Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
60	All cla-valves should be re-built on a 5-year schedule at which time the valves should be disassembled and inspected, any worn parts replaced, and the valve reassembled before returning to service; this service should be provided contractually.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
61	The Water Supply and Distribution Program should test the registration accuracy of commercial water meters on an annual basis. This should initially be performed contractually, but should be provided with in-house staff subsequently.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
62	The Water Supply and Distribution Program should develop a formal written policy and procedure that stuck meters will be inspected and replaced or repaired within one business day of being reported to the program by the Administrative Services Department.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
63	The Water Supply and Distribution Program should be held accountable for reporting to the Assistant Director – Infrastructure and Field Operations – regarding the status of each stuck meter that is still an open work order in the Hansen computerized maintenance management system. If the meter is still stuck, the Program should repair or replace the stuck meter by the end of August 2016.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
64	The Water Supply and Distribution Program should preventively maintain water distribution valves on a biennial basis by completely operating the valve (close and re-open) and counting the turns based on valve size, paint the valve box to identify the opening direction and the position of the valve.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
65	The Water Supply and Distribution Program should discontinue the contract with the County for administering its backflow device testing program and assume these duties itself.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
66	The Water Supply and Distribution Program should adopt a fee for backflow prevention testing to recover the costs associated with administration of the program, and begin charging owners of backflow devices for the administration of the program.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
67	The Water Supply and Distribution Program should re-issue a request for proposal for maintenance and repair of the SCADA system.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
Chapter 8 - Analysis of Engineering				
68	The Engineering Division should develop a <i>Capital Improvement Projects Development and Management Handbook</i> .	Medium	2018	City Engineer
69	The Engineering Division should develop an on-line version of the <i>Capital Improvement Projects Development and Management Handbook</i> (i.e., the guide should be published to the Division's Intranet).	Medium	2018	City Engineer
70	The City Engineer should develop a formal written policy and procedure that clarifies responsibility for managing all of the engineering aspects of the delivery of the City's capital projects from "cradle to grave" as being assigned to the Engineering Division.	Low	2018	City Engineer
71	A summarized twenty-four month bar chart schedule should be prepared for all capital projects that will be designed and scheduled by the Engineering Division	High	2018	City Engineer
72	The Engineering Division should develop project plans to include a project description, financing, budget, responsibility for completing the various components of the capital project, extent of coordination necessary with external agencies, measures of success, a risk assessment, communication plan for external and internal communication, how the quality of the project will be achieved, how the project will be transitioned to Infrastructure and Field Operations upon completion; etc.	High	2017	City Engineer
73	The Engineering Division should utilize cost of construction guidelines to determine the staffing requirements for each capital improvement program project in terms of person hours required for design and construction inspection.	Medium	2018	City Engineer
74	The Engineering Division should establish a "gate" meeting process to enhance communication with and buy-in from Project Owners.	High	2017	City Engineer
75	"Gate" meetings should be conducted at the initiation of the capital project, project scope approval (or approval of the final Project Initiation Plan), 30% design, 60% design, and 100% design, punchlist stage of construction, and project closeout.	High	2017	City Engineer
76	The facilitator of the "gate" meetings should be the project manager assigned to the capital project by the Engineering Division.	High	2017	City Engineer
77	The Engineering Division should utilize the City's project accounting system in Munis to track the costs associated with the design and inspection of capital projects.	High	2017	City Engineer
78	The City Engineer should prepare a resource loaded project schedule for all of the capital projects that will be designed and inspected during that fiscal year.	High	2018	City Engineer

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
79	The Engineering Division should expand its existing monthly capital improvement program project status report.	High	2018	City Engineer
80	The monthly capital improvement program project status report should be posted to the Engineering web site each month.	High	2018	City Engineer
81	The monthly capital improvement program project status report should be used as the basis by the Engineering Division for monthly meetings with Project Owners.	High	2018	City Engineer
Chapter 9 - Analysis of Staffing				
82	The Water Supply and Distribution Program should develop a formal written policy and procedure regarding work order priorities.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
83	Priorities should be assigned to work orders so that essential core services are delivered (e.g., preventive maintenance of assets to maintain the original anticipated useful life of a water utility asset).	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
84	Work order priority #3 (scheduled maintenance) and #4 discretionary maintenance) should only be performed when all of the work orders associated with priority #1 (unscheduled maintenance) and #2 (preventive maintenance) have been completed and there are no pending or backlogged priority #1 and priority #2 work orders.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
85	The Water System Inspector should develop and maintain a database containing all of the permitted backflow devices in Beverly Hills. Once the database is developed, it should be maintained by clerical support staff within the Public Works Department.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
86	The City should maintain a list of State-certified backflow device inspectors and provided to those commercial and industrial businesses with these devices or a link to the County Health Department, who maintains and updates such a list.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
87	The City should send out notices annually to the commercial and industrial businesses with backflow prevention devices requiring testing, along with a list of certified local testers. This notice can be automated, and the notices mailed to commercial and industrial businesses with backflow prevention devices by clerical support staff.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

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Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
88	The commercial and industrial businesses should be required to provide the City with the results of the test and inspection and any repairs to the device. These results should be forwarded to the clerical support staff within the Public Works Department, who should maintain the backflow devices database. If commercial and industrial business do not respond, reminder notices should be mailed by the clerical support staff and, ultimately, the commercial and industrial businesses forwarded to Code Enforcement for failure to respond.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
89	The Water Supply and Distribution Program should maintain an employee who is a State-certified backflow device inspector.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
90	Through attrition, the Water Systems Inspector should be reclassified within the Water Worker classification series. The position should report to the Field Services Supervisor. The position should be utilized for the maintenance and repair of the water supply and distribution system, but also expected to administer the City's backflow prevention device program as workload requires (e.g., one workday a week).	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
91	Entering Water Supply and Distribution Program crew information from work orders into the Hansen computerized maintenance management system should be automated; crews should be provided with tablets or mobile data terminals and should enter this information into the Hansen computerized maintenance management system themselves.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
92	Ensuring that new water meters are entered into the utility billing program should be automated through an interface between the Hansen computerized maintenance management system and the utility billing system.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
93	The utility billing system should link to the Hansen computerized maintenance management system to generate reports for the replacement of meters when meters fail (e.g., zero reads).	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
94	The Administrative Services Department should continue to be responsible for ensuring that meter readings are accurate and checking readings for anomalies.	High	2017	Director of Administrative Services & Chief Financial Officer

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
95	In the mid to long-term, the other responsibilities of the Water System Technician should be assigned to the Water Workers within field operations in the Water Supply and Distribution Program. This includes replacing meter transmission units, performing fire flows and pressure testing and provides results to customers, as requested, etc.	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
96	Through attrition, the Water System Technician should be reclassified within the Water Worker classification series. This position can be more efficiently utilized if the position can perform a myriad of work related to maintenance and repair of water supply and distribution assets, not just water meters.	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
97	Through attrition, three Water Worker III positions should be eliminated when the SCADA system is fully functional, staff have been fully trained in the use of the system, the response to alarms, and how to remotely respond and remediate alarms at the plant.	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
98	The Water Supply and Distribution Program should develop a written policy and procedure regarding the proper uses of overtime, and install more rigorous management controls regarding the use of overtime.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
Chapter 10 - Analysis of GIS				
99	The Civil Engineering GIS Specialist should work with the GIS Coordinator, Information Technology Department to develop and implement a schedule that would result in the completion of the asset registry for the Water Supply and Distribution Program and the syncing of that asset registry with the citywide GIS geodatabase and with the Hansen computerized maintenance management system.	High	2017	Information Technology Director
100	If staff resources are a problem in the completion of the asset registry for the Water Supply and Distribution Program, the Civil Engineering GIS Specialist and the GIS Coordinator, Information Technology Department should work together to marshal sufficient GIS staff resources to complete the asset registry.	High	2017	Information Technology Director
101	The geodatabase for the Water Supply and Distribution Program should be completed in fiscal year 2016-17.	High	2017	Information Technology Director
102	The Information Technology Department should establish a citywide GIS governance committee. The GIS Governance Committee should be assigned responsibility to guide GIS implementation development for the City. The GIS Governance Committee consists of upper management staff from major City departments.	Medium	2018	Information Technology Director

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
103	The Information Technology Department and the Public Works Department should work together to develop a written policy and procedure for the syncing of the Hansen and GIS systems including the frequency of syncing (e.g., daily, weekly, etc.).	High	2017	Information Technology Director
104	The Information Technology Department should work together with the Public Works Department to develop a written policy and procedure regarding GIS data standards so that all location-referenced data collected will be consistent and easily integrated with other GIS data; how the data will be collected, geotagged, and quality controlled; how the data will be updated and with what frequency; where the data will be stored; the analytical tools that will be provided for the analysis of the GIS data; and how the data will be disseminated.	High	2017	Information Technology Director
105	The Information Technology Department should use ESRI data models in the design of the water supply and distribution geodatabase to simplify the process of implementing projects and to help promote industry standards to ArcGIS users on behalf of the Public Works Department	Medium	2017	Information Technology Director
106	The Information Technology Department should use ESRI geometric networks for the water supply and distribution geodatabase, a set of connected edges (lines) and junctions (points), along with connectivity rules to represent and model a common network infrastructure on behalf of the Public Works Department	Medium	2018	Information Technology Director
107	The Information Technology Department should use the ESRI ArcGIS Workflow Manager for the water supply and distribution geodatabase on behalf of the Public Works Department	Medium	2018	Information Technology Director
108	The Information Technology Department should acquire and use an ArcSDE geodatabase on behalf of the Public Works Department	Medium	2017	Information Technology Director
109	The Information Technology Department should increase and enhance the use of geoprocessing models and scripts on behalf of the Public Works Department.	Medium	2017	Information Technology Director
110	The Information Technology Department should use the Infrastructure Network Editing template on behalf of the Public Works Department	Medium	2017	Information Technology Director
111	The Information Technology Department should use the ArcGIS Data Reviewer on behalf of the Public Works Department.	Medium	2017	Information Technology Director
Chapter 12 - Analysis of Water Resources				
112	The Water Supply and Distribution Program should report its progress in accomplishing the recommendations contained in the Water Enterprise Plan to the Public Works Commission on an annual basis.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

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#	Recommendation	Priority	Schedule	Responsibility
113	The Civil Engineer position in the Building and Safety Division should continue to be assigned responsibility for development review on behalf of the Public Works Department to ensure adherence to the standard specifications of the Public Works Department and that the infrastructure and systems are capable of supporting the proposed development.	High	2017	Assistant Public Manager
114	The Civil Engineer position in the Building and Safety Division should function in the same manner as the GIS Integrator and the Systems Integrator positions in the City, which are budgeted in the Information Technology Department, but assigned to work directly with operating departments. In the instance of the Civil Engineer, the Civil Engineer should be budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
115	The Water Resources Manager should not be assigned any development review workload on an ongoing basis; this workload should be borne by the Civil Engineer budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
116	Given the capital project workload associated with the Water Supply and Distribution Program, including the implementation of the Water Enterprise Plan, the two Project Managers positions in the Engineering Division funded by the Water Enterprise Fund should be assigned to Water Supply and Distribution Program capital projects on a full-time basis.	High	2017	Public Works Director
Chapter 13 - Analysis of Utility Billing				
117	The Administrative Services Department should develop a proposal for the consideration of the City Council regarding the costs and benefits of the conversion of water utility billing from bi-monthly billing to monthly billing.	Medium	2018	Director of Administrative Services & Chief Financial Officer
118	The Administrative Services Department should mail the final notice that the City will initiate shut off at 36 calendar days after the initial bill was mailed and the notice to suspend service at 45 calendar days after the initial bill being mailed.	High	2018	Director of Administrative Services & Chief Financial Officer
119	The Administrative Services Department should increase the % cost for late payments to 2% per month.	High	2018	Director of Administrative Services & Chief Financial Officer
120	The Administrative Services Department should acquire web interface commercial off the shelf software to enable electronic billing, payment, and communication with utility customers.	Medium	2018	Director of Administrative Services & Chief Financial Officer

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
121	The Water Supply and Distribution Program and the Administrative Services Department should work together to reduce the extent of meter re-reads. This should include the ongoing and proactive reconciliation of meter account data for each billing cycle within Aclara to the meter account data within the utility billing system in Munis. Before each billing cycle, the Field Services Representative should compare the meter account data in Aclara to the meter account data in Munis, identify discrepancies, collect the meter account data in the field to resolve the discrepancies, and enter the correct meter account data in Aclara or Munis.	High	2017	Director of Administrative Services & Chief Financial Officer
122	The process to provide proactive reconciliation of meter account data within Aclara to the meter account data within the utility billing system in Munis should be clarified in a formal written policy and procedure developed by the Water Supply and Distribution Program and the Administrative Services Department.	High	2017	Director of Administrative Services & Chief Financial Officer
123	When the Public Works Department proceeds forward with the re-optimization of the Hansen computerized maintenance management system within the Water Supply and Distribution Program, the utility billing unit in the Administrative Services Department should be provided with access so that unit can issue work orders on-line to the Program to request meter re-reads, the repairs or replacement of stuck meters, etc.	High	2018	Director of Administrative Services & Chief Financial Officer
124	The Administrative Services Department and the Water Supply and Distribution Program should work together to assess the coverage of the Data Collector Units in Beverly Hills, and whether additional units should be installed to reduce coverage gaps, the risks of failure from one specific Data Collector Unit, etc.	Medium	2017	Director of Administrative Services & Chief Financial Officer
125	The Administrative Services Department and the Water Supply and Distribution Program should work together to develop a written operational plan for the system-wide replacement of the meter transmission units.	Low	2018	Director of Administrative Services & Chief Financial Officer
126	The Administrative Services Department should develop the capacity to collect and to report metrics of customer service for the City's utility call center such as % of calls answered within 20 seconds, within 30 seconds, and within 60 seconds; the % of calls abandoned; etc.	High	2017	Director of Administrative Services & Chief Financial Officer
Chapter 14 - Analysis of Emergency Planning				
127	The Water Supply and Distribution Program should finalize its draft <i>Water Main Emergency Action Plan</i> .	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

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Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
128	The Water Supply and Distribution Program, upon finalizing the draft <i>Water Main Emergency Action Plan</i> , should train its staff on an annual ongoing basis in the plan and conduct exercises to enable staff to practice the plan.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
Chapter 15 - Analysis of Administration				
129	The Water Supply and Distribution Program should develop a strategic plan to include goals, objectives, and metrics to measure the successful implementation of the strategic plan.	Medium	2018	Assistant Public Works Director – Infrastructure and Field Operations
130	The Water Supply and Distribution Program should develop goals, objectives, and performance measures for each functional area within the Division.	Medium	2018	Assistant Public Works Director – Infrastructure and Field Operations
Chapter 16 - Analysis of Real Property				
131	The Public Works Department should assign responsibility to its Assistant Property Manager position, once filled, to conduct a market-based rent analysis of these three properties - 333 South La Cienega Boulevard, the West Hollywood pipe yard, and the Public Works facility at 345 North Rexford - and develop recommendations regarding the rent that should be paid by the General Fund to the Water Enterprise Fund for these three properties that reflects their market-based rent, given the current conditions of the property.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
132	The Assistant Property Manager position should also be assigned responsibility for developing recommendations regarding the appropriate market-based rent that should be provided by the Water Enterprise Fund to the General Fund for properties “owned” by the General Fund, but used by the Water Enterprise Fund for water storage tanks.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
Chapter 17 - Analysis of the Plan of Organization				
133	Upon the retirement of the Water Operations Manager, the Water Resources Manager position should be assigned responsibility for managing the Water Supply and Distribution Program.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

#	Recommendation	Priority	Schedule	Responsibility
134	The vacant Water Operations Manager position should be reclassified within the civil engineering series and, under the supervision of the Water Resources Manager position, utilized to coordinate the implementation of the Water Enterprise Plan.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
135	The Civil Engineering GIS Specialist should be transferred from the Public Works Department to the Information Technology Department, but continue to be physically based in the Public Works Department administration building.	High	2017	Deputy Director of Public Works - Operational Support

2. PROFILE OF THE WATER SUPPLY AND DISTRIBUTION PROGRAM

This chapter presents a descriptive profile of Water Supply and Distribution Program of the City of Beverly Hills, California. The chapter opens with background information regarding the City of Beverly Hills.

1. THE WATER SUPPLY AND DISTRIBUTION PROGRAM FOR THE CITY OF BEVERLY HILLS SERVES AN AREA ENCOMPASSING SEVEN SQUARE MILES AND A POPULATION OF 43,200.

The State Department of Finance estimates that the population of the City of Beverly Hills, as of January 1, 2016, was 34,763.

The *Southern California Association of Government* does not expect that the population of the City will change materially over the next two decades. In its 2012-2035 Regional Transportation Plan / Sustainable Communities Strategy, the *Southern California Association of Government* projected that the population of the City to increase to 38,500 by the year 2035.

In addition, the population of Beverly Hills has not increased substantially over the past two and one-half decades. In 1990, the population of the City was 31,971. Since 1990, the population of Beverly Hills has increased by 8.7%.

The Water Supply and Distribution Program for the City of Beverly Hills also serves 23.5% of the City of West Hollywood. The State Department of Finance estimates that the population of the City of West Hollywood as of January 1, 2016, was 35,923. This would indicate that the Water Supply and Distribution Program serves a population of approximately 8,441 in the City of West Hollywood.

The *Southern California Association of Government* does not expect that the population of the City of West Hollywood will change materially over the next two decades. In its 2012-2035 Regional Transportation Plan / Sustainable Communities Strategy, the *Southern California Association of Government* projected that the population of the City to increase to 39,800 by the year 2035.

2. THE WATER SUPPLY AND DISTRIBUTION PROGRAM REPORTS TO AN ASSISTANT DIRECTOR OF PUBLIC WORKS.

The Public Works Department provides a range of services such as wastewater and solid waste disposal. The Department is authorized 217.8 full-time positions and 67.7 full-time equivalent part-time positions in fiscal year 2015-16, including the positions in what was the Capital Assets Department (now part of the Public Works Department).

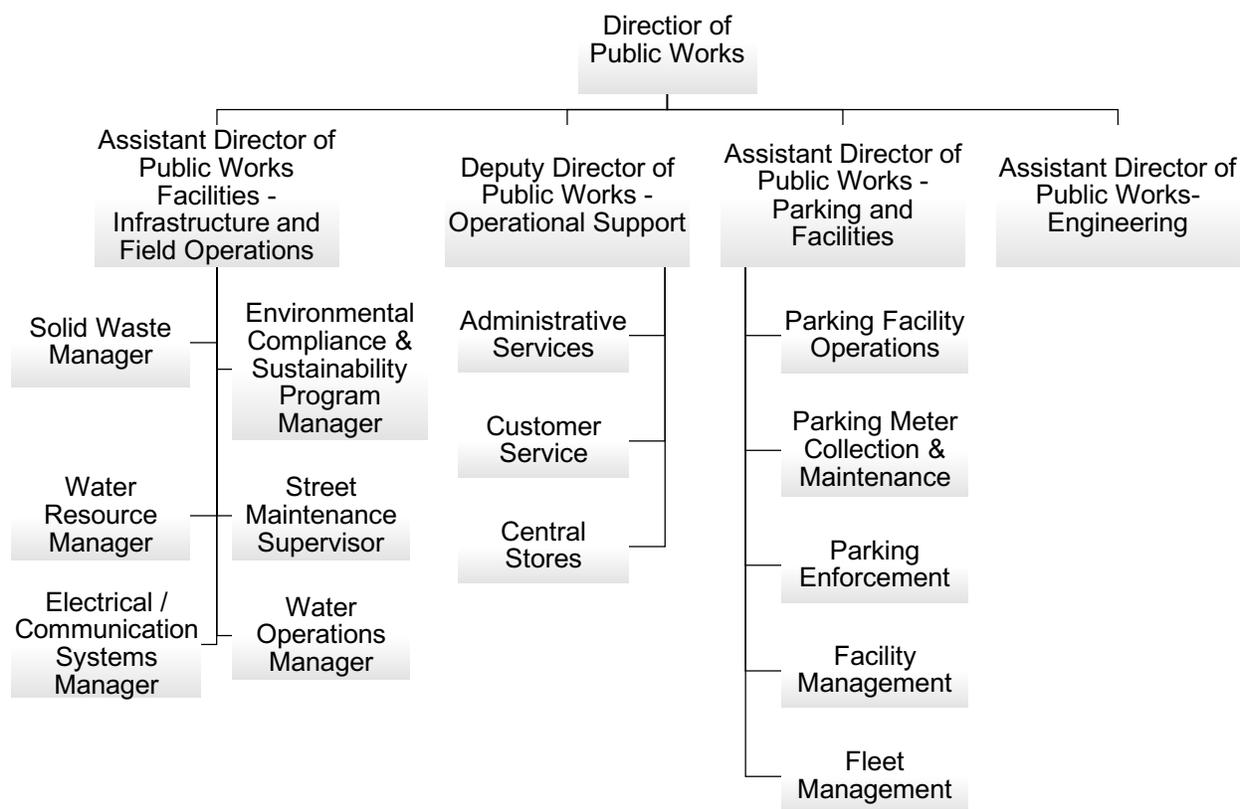
The Water Supply and Distribution Program, includes Groundwater Production, Plant Operations, Metropolitan Water District (MWD) Transmission, Maintenance and Repair, Water Quality, Water Services and Installations, Water Conservation and Fire Hydrant.

The water utility currently operates as a part of the City's Public Works Department, with services (such as billing and collections, human resources, information technology, etc.) provided by other departments. The Water Supply and Distribution Program reports to an Assistant Director of Public Works. Important points to note regarding the plan of organization for the City's Public Works Department are presented below.

- The Director of Public Works is the departmental director for the Public Works Department, reports to the City Manager, and supervises four Assistant Directors of Public Works.

- The Assistant Director of Public Works – Infrastructure and Field Operations is responsible for managing an extensive range of municipal services and supervises the Solid Waste Manager, the Environmental Compliance and Sustainability Program Manager, Water Resource Manager, the Street Maintenance Supervisor, the Electrical / Communication Systems Supervisor, and the Water Operations Manager.

The plan of organization for the Public Works Department, and the specific reporting relationships for the Assistant Director of Public Works – Infrastructure and Field Operations, is presented below.



The City purchases the majority of its water from the MWD, but also operates a reverse osmosis water treatment plant. The plant treats water drawn from four (4) groundwater wells located, with future wells presently under development.

The table below presents the metered gallons of water consumed by customers

of the Water Supply and Distribution Program since January 2012.

Month	2012	2013	2014	2015	2016
January	810.5	717.6	865.5	769.7	638.8
February	717.7	669.2	736.8	775.8	663.6
March	852.5	821.7	781.4	895.9	706.9
April	842.7	962.9	929.0	920.8	742.0
May	962.8	1,047.3	1,155.9	869.6	798.7
June	969.2	1,020.8	1,038.6	841.7	862.6
July	1,031.3	1,185.5	1,210.6	929.0	932.3
August	1,207.5	1,184.4	1,169.6	976.6	
September	1,138.6	1,060.6	1,089.9	918.5	
October	984.3	1,006.1	1,037.5	897.4	
November	892.0	865.7	878.7	814.7	
December	621.0	822.5	632.2	779.3	
TOTAL	13,042.1	13,377.3	13,539.7	12,404.0	7,360.9

The water consumed by customers of the Water Supply and Distribution Program decreased by 8.4% in 2015 versus 2014. In the first seven months of 2016, the water consumed by customers of the Water Supply and Distribution Program decreased another 11% versus 2015, although water consumed in June and July 2016 exceeded the same months in 2015.

The Water Supply and Distribution Program serves 11,072 metered accounts with water meters ranging from 1” or less to water meters as large as 10”. The distribution of water meters by size of meter is presented in the table below.

Size of Water Meter	Number of Water Meters	% of Total
1" or less	7,498	67.7%
1.5"	1,875	16.9%
2"	1,145	10.3%
3"	150	1.4%
4"	275	2.5%
6"	111	1.0%
8"	14	0.1%
10"	4	0.0%
TOTAL	11,072	100.0%

As the table indicates, almost 85% of the metered accounts served by the Water Supply and Distribution Program consist of 1.5" or smaller water meters. A little more than 15% of the meters are commercial meters (equal to or more than 2" water meters).

3. THE WATER SUPPLY AND DISTRIBUTION PROGRAM WAS AUTHORIZED 36.43 POSITIONS FOR FISCAL YEAR 2015-16.

The Water Supply and Distribution Program is authorized 36.43 full-time equivalent positions. The number of authorized positions and their classification title is presented in the first exhibit at the end of this chapter.

These staff are responsible for the maintenance, repair, water quality and operation of the water supply and distribution system including approximately 171 miles of water mains, 11 water reservoirs, 1,500 butterfly valves, 2,300 gate valves, 1,300 fire hydrants, and 10 pumping stations.

The plan of organization for the Water Supply and Distribution Program is presented in the second exhibit at the end of this chapter. The roles and responsibilities for the full-time staff authorized for the Water Supply and Distribution Program are presented in the third exhibit at the end of this chapter.

4. THE WATER SUPPLY AND DISTRIBUTION PROGRAM HAS NOT FULLY IMPLEMENTED A NUMBER OF KEY INFORMATION TECHNOLOGIES.

The matrix below summarizes key information technologies used by the Water Supply and Distribution Program.

System	Key Functions
SCADA software by Ignition	Monitors and controls treatment plant, 9 of the 11 reservoirs and 9 of the 11 pump stations.
Hansen Computerized Maintenance Management System, version 8.2	Water asset management Work order issuance and tracking
Automated Meter Reading System, Aclara Technologies, STAR	The City uses this software as part of its wireless, automated water meter reading system. The City uses this software to extract information for water utility billing, generate leak detection reports, and to feed information into the City's water tracker program for customers to track their water use.
Geographic Information Systems, ESRI	The geographic information system can be used for asset management, planning and analysis, field operations, operations management, and customer service.

Important points to note regarding the information technologies are presented below.

- **Supervisory Control and Data Acquisition System (SCADA).** In December 1998, the City upgraded to a fully computerized SCADA System (Supervisory Control and Data Acquisition System). The SCADA software is utilized to monitor and control the reverse osmosis plant, nine of the eleven reservoirs, and four of the eleven water pump stations. The original SCADA system is a proprietary system installed by Macro Automatics more than twenty years ago.

The SCADA software is utilized for:

- Security monitoring;
- Monitor and control the water distribution system;
- Water quality monitoring (sensors including flow, pressure and depth, and water quality sensors);
- Equipment management,
- Data management;

- Process control (remotely control processes including pumping system operations, chemical addition and water storage leveling); and
- Alarm condition identification.
- **Computerized Maintenance Management System.** The City initially implemented the Hansen computerized maintenance management system in 1997 primarily for water asset management. In 2009, the City upgraded to the Hansen 8.x platform and expanded the assets under management to include water, storm water, streets, sewers, physical plant, work order management, inventory, and GIS. While progress has been made, the City has not fully leveraged the potential of the system as a comprehensive asset management and work order management system.

The City will be retaining a consulting firm to re-implement and optimize the computerized maintenance management system. This will, initially, only include Enterprise GIS and Engineering Division GIS, wastewater (stormwater and sanitary sewer), Facility Management, Central Stores (warehouse), and Customer Service. The Water Supply and Distribution Program would not be included, initially, in the re-implementation and optimization.

The award of the contract to retain the consulting firm is pending approval by the Information Technology Department.

- **Automated Meter Reading System.** In 2008, the City Council approved the implementation of an Aclara automated water utility meter reading system in lieu of a manual meter reading system. The automated system allows for the wireless collection of information beyond meter reads including leak detection information, tamper detection, and reverse flow detection to be captured, transmitted and communicated to the City's database daily. The water consumption information is also used to track water usage and better streamline utility billing operations. The meter transmitting units are affixed to each water meter; there are approximately 11,000 of these units located throughout the City's service area. Each meter transmitting units records the water consumption usage from each meter and wirelessly transmits the information to a data collection unit. These data collection units transmit the water usage information to the Network Control Computer, a server that feeds the water consumption information into the STAR program. The STAR program is used by City staff to extract information for utility billing, generate leak detection reports, and feeds information into the City's water tracker program for customers to track their water usage.
- **Geographic Information System (GIS).** A geographic information system is a database that is linked to different features stored in GIS layers (e.g., address layer, fire hydrant layer, distribution valve layer, water main layer, etc.). The geographic information system serves as a database of water utility asset information that should be shared and integrated with other enterprise business

systems (e.g., utility billing). To maximize the benefit of GIS, the data being shared must be reliable. Water utility asset data in the GIS must be accurate positionally (in the right place), descriptively (describes the asset appropriately), and temporally (up-to-date). Water utilities must focus on quality assurance and quality control to ensure that their GIS data meets their needs.

The geographic information system for the Water Supply and Distribution Program remains a work in progress: much of the asset data is still going through quality assurance and quality control. The geographic data is being verified using interns, and the extent of completion of verification varies by type of water utility asset. For example, fire hydrants are approximately 95% to 98% complete, backflow prevention devices are approximately 55% complete, pressure reducing valves are approximately 20% complete, water distribution mains are approximately 55% complete, and water meters are approximately 97% complete. The geographic information system is not linked to the computerized maintenance management system to enable geographical depictions of what water utility maintenance and repair work was performed where (e.g., the geographical location of water main breaks), cannot be used to develop a complete geographic map of water utility assets, and cannot be linked to mobile laptops in the field for water utility staff (e.g., the location of distribution valves).

The Water Supply and Distribution Program has an array of information technology that would be expected in a well-run and well managed water utility. However, much of this technology has yet to be fully implemented and operational.

5. OVER THE FOUR FISCAL YEARS FROM 2011-12 TO 2014-15, OPERATING REVENUE FOR THE WATER SUPPLY AND DISTRIBUTION PROGRAM INCREASED BY 16%, WHILE OPERATING EXPENSES INCREASED BY 19%.

The table at the top of the next page presents revenue and expenditure data for the Water Supply and Distribution Program for the four fiscal years from 2011-12 to 2014-15. The source of this data was the Comprehensive Annual Financial Reports.

CITY OF BEVERLY HILLS, CALIFORNIA
Management Study of the Water Supply and Distribution Program

	2011-12	2012-13	2013-14	2014-15
Operating Revenues	\$31,124,854	\$34,945,035	\$38,606,049	\$36,067,148
Operating Expenses				
Salaries and Employee Benefits	\$2,730,989	\$2,929,187	\$3,321,216	\$3,270,029
Maintenance and Operation	\$17,786,590	\$19,974,285	\$22,576,453	\$21,906,829
Depreciation	\$3,765,700	\$3,912,964	\$3,951,342	\$3,966,181
Amortization of bond premiums, discounts and deferred amounts on refunding	\$12,269	\$(153,974)	\$(193,895)	\$(170,929)
Total Operating Expenses	\$24,295,548	\$26,662,462	\$29,655,116	\$28,972,110
Operating Income (Loss)	\$6,829,306	\$8,282,573	\$8,950,933	\$7,095,038
Non-Operating Revenues (Expenses)				
Investment Revenue	\$285,020	\$230,618	\$412,400	\$435,095
Net change in the fair value of investments	\$(45,806)	\$(355,149)	\$127,379	\$(89,426)
Interest expense	\$(3,523,197)	\$(2,795,080)	\$(2,718,854)	\$(2,637,637)
Intergovernmental revenue	\$-	\$-	\$-	\$73,375
Other revenue (expense)	\$32,905	\$(1,262)	\$51,679	\$150,240
Total non-operating revenues (expenses)	\$(3,251,078)	\$(2,920,873)	\$(2,127,396)	\$(2,068,353)
Income (loss) before operating transfers	\$3,578,228	\$5,361,700	\$6,823,537	\$5,026,685
Transfers In	\$11,618,602	\$-	\$-	\$2,000,000
Transfers Out	\$(11,287,347)	\$-	\$-	\$-
Change in Net Position	\$3,909,483	\$5,361,700	\$6,823,537	\$7,026,685

Important points to note concerning the change in revenues and expenditures for the Water Supply and Distribution Program are also provided on the next page.

- In the four fiscal years, Operating Revenue increased by 20%. However, from 2013-14 to 2014-15, Operating Revenue actually decreased by \$2.5 million or 7%.
- Over the same four fiscal years, Operating Expenses increased by 19%. Almost 90% of the increase in operating expenses resulted from increases in Maintenance and Operations.

- Operating Income increased by 4% in the four fiscal years.
- Total non-operating expenses decreased by 36% in the four fiscal years.
- Income before transfers increased by 40% in the four fiscal years, although it decreased by 28% from 2013-14 to 2014-15.
- The City's general fund made a transfer in of \$2 million in fiscal year 2014-15. Without that transfer, the Change in Net Position would have decreased by 28%.

Overall, there were a number of trends that indicated financial challenges for the Water Supply and Distribution Program.

One financial challenge was the decrease in Operating Revenue: from 2013-14 to 2014-15, Operating Revenue decreased by \$2.5 million or 7%.

Another challenge was the 19% increase in Maintenance and Operations in the four fiscal years: 90% of the increase in Operating Expenses resulted from increases in Maintenance and Operations. This reflects the age of the City's water supply and distribution system and the increased costs associated with the maintenance and repair of that system, and the increased costs associated with meeting regulatory requirements, enhancing security of the water supply and distribution infrastructure, and potable water. The *American Society of Civil Engineers* estimated that the cumulative cost to households in the United States from degrading water and wastewater infrastructure will add up to \$59 billion (in 2010 dollars) over the period between 2013 and 2020, the cost to business will be more than double that, at \$147 billion.

6. REVENUE FROM CURRENT RATES WILL BE UNABLE TO COVER THE WATER UTILITY ENTERPRISE'S COSTS WITHOUT DEPLETING RESERVES.

Funding for the new Water Enterprise Plan, which includes capital improvement projects to increase the City's water system reliability, and the increased cost of purchased water (after the initial cost savings from customer's conserving during FY 2015-16) are the

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primary reasons for the projected revenue requirement as indicated in the table below.⁴

Category of Revenue Requirement	2016-17	2017-18	2018-19	2019-20	Increase (\$)	Increase (%)
Purchased Water	\$10,802,036	\$11,273,676	\$11,643,677	\$12,101,527	\$1,299,491	12.03%
O & M Personnel	\$4,339,532	\$4,469,718	\$4,603,810	\$4,741,924	\$402,392	9.27%
WEP Personnel & Capital	\$2,130,207	\$2,889,495	\$2,940,293	\$4,172,349	\$2,042,142	95.87%
ISF Charges	\$7,447,644	\$7,648,731	\$7,878,193	\$8,114,538	\$666,894	8.95%
Other O & M	\$5,126,252	\$5,312,844	\$5,507,585	\$5,713,102	\$586,850	11.45%
Capital Expenses	\$9,858,438	\$9,861,188	\$9,871,988	\$9,871,388	\$12,950	0.13%
TOTAL	\$39,704,109	\$41,455,652	\$42,445,546	\$44,714,828	\$5,010,719	12.62%

Important points to note concerning the table are presented below.

- These projected water utility revenue requirement projections were developed by HF & H Consultants as part of the City's water rate study, completed in December 2015.
- Over the four-year period from fiscal year 2016-17 to 2019-20, revenue requirements (or expenditures) are expected to increase by \$5.0 million or a total of 12.6%.
- Water Enterprise Plan Personnel and Capital revenue requirements or costs are expected to increase by 96%. Indeed, Water Enterprise Plan Personnel and Capital revenue requirements or costs comprise 41% of the total increase for the water utility.
- Purchased Water revenue requirements or costs are expected to increase by 12%. Indeed, Purchased Water revenue requirements or costs comprise 26% of the total increase for the water utility.
- Internal Service Fund charges requirements or costs are expected to increase by 9%. Internal Service Fund revenue requirements or costs comprise 13% of the total increase for the water utility.

These three categories of revenue requirements, Water Enterprise Plan Personnel and Capital, Purchased Water, and Internal Service Fund charges comprise 80% of the basis for the projected water utility revenue requirements or costs.

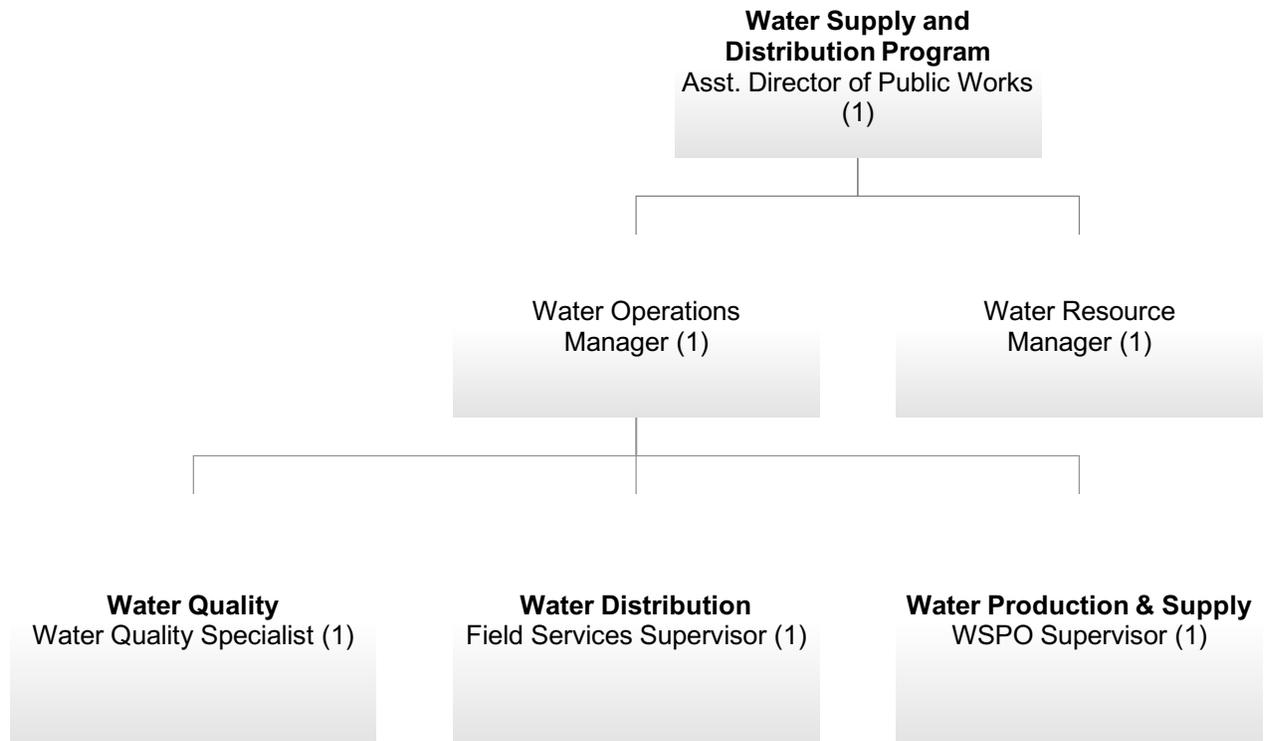
⁴ HF & H Consultants, Water Rate Study for the City of Beverly Hills, December 2015

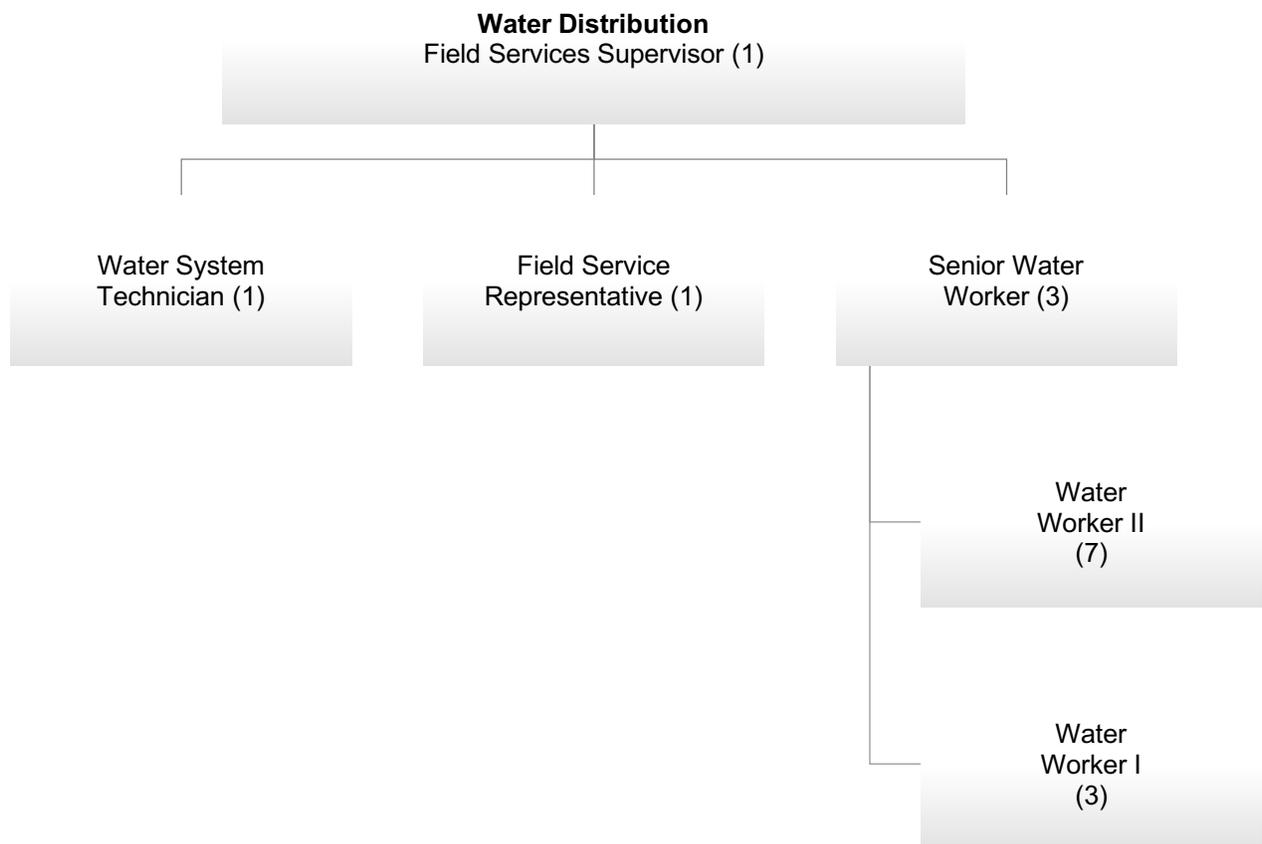
Exhibit I

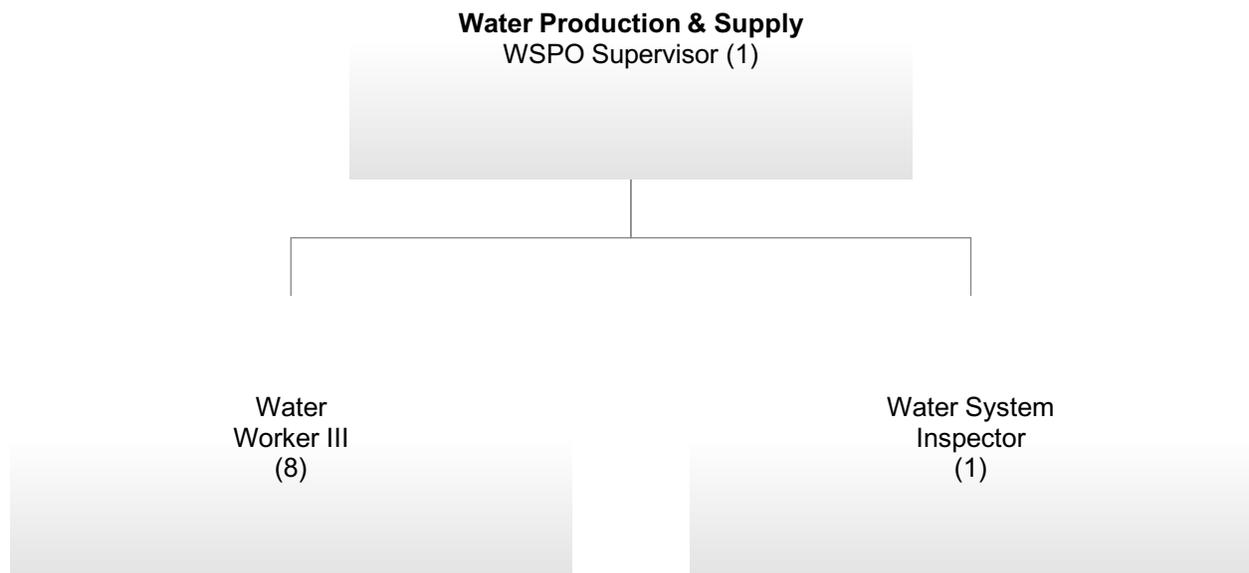
**Number of FY 2015-16 Authorized Positions for the
Water Supply and Distribution Program**

Class Title	Number of Authorized Positions
Environmental Program Inspector	0.10
Field Services Representative	1.00
Field Supervisor	0.85
Senior Water System Worker	3.00
Water Operations Manager	1.00
Water Quality Specialist	0.80
Water System Inspector	1.00
Water System Production / Operations Supervisor	1.00
Water System Technician	2.00
Water System Worker I	3.00
Water System Worker II	10.00
Water System Worker III	8.00
Infrastructure Locating Technician	0.25
Deputy Director of Operational Support	0.08
Assistant Director of Public Works - Infrastructure and Field Operations	0.25
Environmental Compliance and Sustainability Program Manager	0.10
Conservation Coordinator	1.00
Water Resource Manager	1.00
Project Manager	2.00
TOTAL	36.43

Plan of Organization of the Water Supply and Distribution Program







**Roles and Responsibilities of the Staff of the
Water Supply and Distribution Program**

Class Title	# of Positions		Roles and Responsibilities
	Auth.	Actual	
Administration			
Assistant Director of Public Works	1	1	<ul style="list-style-type: none"> • Reports to the Director of Public Works. • Oversees a variety of PWS services including Utilities; Traffic Signs and Street Lights; Street Maintenance; and Environmental Compliance and Sustainability. • With respect to Utilities services, directly oversees and supervises the Utility Services Manager and the Water Resource Manager. Provides work direction to Analyst staff. • Plans, organizes and directs the staff and the services delivered by Utilities Services • Responsible for oversight of the Water Supply & Distribution programs to include Groundwater, Maintenance and Repair, Water Quality, Water Services and Installations, Water Conservation and Fire Suppression. Key roles and responsibilities include planning, scheduling, budgeting, personnel, resource forecasting, and special projects.
Water Resource Manager	1	1	<ul style="list-style-type: none"> • Reports to the Assistant Director of PWS. • Responsible for oversight and execution of the 2015 10-year Water Enterprise Plan (WEP). • Coordinates with Engineering resources, such as Project Managers, to implement WEP projects. • Devising and formalizing the Development Review process for water utilities including “will serve” components, plan review criteria, etc. • Providing support related to the Plant rehabilitation capital project. • Intended to work on hydraulic modeling initiatives. • Performs other special projects, such as capital planning, as directed.

Class Title	# of Positions		Roles and Responsibilities
	Auth.	Actual	
Water Supply & Distribution			
Water Operations Manager	1	1	<ul style="list-style-type: none"> • Reports to the Assistant Director of PWS. • Responsible for oversight of water distribution, water production and supply and water quality programs. • Directly supervises the Field Services Supervisor; Water System Production Supervisor; and Water Quality Specialist. • Directs programs and personnel related to corrective and preventive maintenance of infrastructure; project planning; results reporting; problem resolution and staff scheduling, training and performance. • Performs special projects, as assigned.
Water Quality Specialist	1	1	<ul style="list-style-type: none"> • Reports directly to the Water Operations Manager. • Responds to water quality complaints from customers served. Visits all sites at which water complaints are received, collecting samples, testing water, etc. • Reviews various production, supply and water quality reports and performs analytics upon information. Reviews all data from sampling locations, ensuring accuracy and completeness. Schedules sampling at sites. Provides information and recommendations to Engineering and other Utilities staff. • Performs complex water sampling tasks. • Monitors compliance with NPDES permit requirements on quarterly basis. Reviews, processes and signs various reports, to include Department of Health, NPDES, EPA, SWRCB and others. • Prepares Annual Consumer Confidence Report. • Acts as Utilities' Chief Operator, possessing D4/T4 certification, and consequently on-call 24/7. • Trains staff in new regulations and their impacts, sampling techniques, etc. • Oversees calibration of equipment at reservoir sites and in non-State-certified lab. • Performs special projects, as assigned.

Class Title	# of Positions		Roles and Responsibilities
	Auth.	Actual	
Field Services Supervisor	1	1	<ul style="list-style-type: none"> • Reports directly to the Water Operations Manager. • Oversees and supervises staff and programs of water distribution. Assigns field crews to work dependent upon corrective and preventive maintenance needs. • Facilitates prioritization and scheduling of distribution system corrective and preventive maintenance tasks. • Oversees projects related to new water service installations ranging from 1"-6", 4"-10" fire service installations; meter taps; meter box installations; meter installation; hydrant installations and other small force-account construction and maintenance. • Responds to customer service inquires regarding distribution infrastructure. • Works with Hansen CMMS to create work orders. • Interfaces daily with field staff. • Performs special projects, as assigned.
Senior Water Worker	3	1	<ul style="list-style-type: none"> • Reports directly to the Field Services Supervisor. • Serves as lead worker on a field crew, directing crew members, making field decisions, interacting with residents and businesses. • Required to possess a T3 Treatment Plant certificate and a D2 certification for distribution system maintenance issued by the State Water Resources Control Board. • Work schedule: M-Th, 7:00 am – 4:30 pm, Fri 7:00 am – 3:30 pm, M-Th 7:00 am – 4:30 pm, Fri – off. (in 2-week period, works 9 hours per day for 8 days, 8 hours on one day, and off on one day.)
Water Worker II	7	7	<ul style="list-style-type: none"> • Serves as member of a field crew, typically serving as the heavy equipment operator as required. • Performs such duties as valve turning; service line installation, repair and replacement; replacement of valves; repair and maintenance of relief valves and Clay valves, and other similar corrective maintenance duties. • Required to possess a D2 certification by the State Water Resources Control Board; a Class B license; and a Clay Valve certificate. • Work schedule: M-Th, 7:00 am – 4:30 pm, Fri 7:00 am – 3:30 pm, M-Th 7:00 am – 4:30 pm, Fri – off. (in 2-week period, works 9 hours per day for 8 days, 8 hours on one day, and off on one day.)

Class Title	# of Positions		Roles and Responsibilities
	Auth.	Actual	
Water Worker I	3	3	<ul style="list-style-type: none"> • Works as a member of a crew performing such duties as service line installation, repair and replacement; replacement of valves; repair and maintenance of relief valves and Clay valves, and other similar duties. Assists the Water Worker II positions in the performance of their work. • Typically performs manual work as member of crew, using hand tools to dig holes, break concrete, etc. • Required to possess a D1 certification by the State Water Resource Control Board. • Work schedule: M-Th, 7:00 am – 4:30 pm, Fri 7:00 am – 3:30 pm, M-Th 7:00 am – 4:30 pm, Fri – off. (in 2-week period, works 9 hours per day for 8 days, 8 hours on one day, and off on one day.)
Water System Technician	1	1	<ul style="list-style-type: none"> • Reports directly to the Field Services Supervisor. • Oversees meter and fire programs and provides various support services, including usage of STAR system. • Runs reports for the replacement of meters when they fail. • Replaces meter transmission units (MTU). • Ensures that readings are accurate. • Checks readings weekly to check for anomalies. • Performs fire flows and pressure testing and provides results to customers, as requested. • Enters crews' information from work-orders into Hansen CMMS. • Ensures that new meters are entered into the billing program.
Field Service Representative	1	1	<ul style="list-style-type: none"> • Reports directly to the Field Services Supervisor. Obtains work direction from the Administrative Services Department. • Obtains work orders from Administrative Services Department and from the Field Services Supervisor related to meter turn-offs, final reads, etc. • Checks on reports of water leaks, etc., while in field. Creates work orders for field crews based on findings in field. Enters completed work details into the Hansen CMMS. • Works M-F from 8:00 am till 4:30 pm.

Class Title	# of Positions		Roles and Responsibilities
	Auth.	Actual	
Water System Production / Operations Supervisor	1	1	<ul style="list-style-type: none"> • Reports directly to the Water Operations Manager. • Oversees and supervises staff and programs of water production and supply. Manages water production plant. • Assigns field crews to work dependent upon corrective and preventive maintenance needs. • Develops work schedules for Water Workers III in the Plant. • Makes decision in the field regarding needed repairs, and whether these should be performed by internal staff or by contractors. • Facilitates and manages contracted repairs to production/storage infrastructure including mechanical, electrical and electronic. • Interfaces with Parks and Recreation who maintains production/storage grounds. • Responsible for providing policy guidance and recommendations on utility matters to the Assistant Director. • Possesses a T4 certification.
Water Worker III	8	5	<ul style="list-style-type: none"> • Reports to the WSPO Supervisor. • Responsible for the operations of the Reverse Osmosis Water Treatment Plant at Foothill Road, monitoring chemical feeds, motor and pump function, taking samples at various points in the system, and others. • Operators have assigned responsibilities for the physical inspection of reservoirs, pump stations, chlorinators, and/or the fluoride station. Duties include, for example, checks of air relief valves, operation of clay valves, kilowatt hour checks, resolution of unusual vibratory sounds, etc. • Performs minor preventive and corrective maintenance such as painting, oil changes, and minor repairs. • Sample 11 reservoirs each night for water quality per DPH directive. • Monitors plant and pump station operations via SCADA. Monitors chlorine manually at sites. • Takes Bac-T samples at 21 points in the system on weekly basis. • Logs daily activities in manual log; not using Hansen CMMS. • Employees work a 9/80 shift program either a day, swing or night shift, ensuring the consistent staffing of the Plant on a 24/7 cycle.

Class Title	# of Positions		Roles and Responsibilities
	Auth.	Actual	
Water Systems Inspector	1	1	<ul style="list-style-type: none"> • Reports to the WSPO Supervisor. • Responsible for developing and enacting the City's backflow prevention program. • Makes field visits to construction sites to determine whether backflow prevention devices are needed and, if so, where these devices should be placed. • Performs bi-weekly inspections, as directed. • Receives data from LA County regarding devices that are due for annual inspection. The County currently sends notices to residents and businesses that are due for inspection.

3. DIAGNOSTIC APPRAISAL OF THE WATER SUPPLY AND DISTRIBUTION PROGRAM

This chapter presents the findings regarding the application of best practices to Water Supply and Distribution Program. The best practices have been derived from the consulting team's collective experience and professional associations such as the American Public Works Association, and identify strengths as well as improvement opportunities.

1. WATER SUPPLY AND DISTRIBUTION PROGRAM ADMINISTRATION

There are a number of positive aspects to Water Supply and Distribution Program Administration. Examples of these positive aspects are presented below.

- The Assistant Public Works Director has created a resource forecasting spreadsheet to forecast staffing needs. The spreadsheet identified crew sizes and time by task. This spreadsheet will form the foundation for determining staffing needs by time period. The spreadsheet was populated by going through each activity to determine (1) the list of activities (2) number of labor hours on average for the activity (3) crew sizes (4) how many activities are done in a year (5) when the activities are typically done.
- The Water Supply and Distribution Program just established a "dashboard" that tracks sampling results, production levels, demand by day, etc.
- The Water Supply and Distribution Program provides a Consumer Confidence Report on an annual basis that is provided to residents.
- The City has established a water capacity fee, and is proposing a water exaction fee (developers pay for their increased demand for water) for the consideration of the City Council.
- Employees of the Water Supply and Distribution Program hold appropriate State certification. The Water Supply and Distribution Program also compensates employees for obtaining certifications beyond the minimum requirements.

There are opportunities for improvement, however. These opportunities are presented below.

- The Water Supply and Distribution Program has not developed a strategic plan.
- The Water Supply and Distribution Program has not developed goals, objectives, and performance measures. The Water Supply and Distribution Program does not measure performance against established standards, and does not report performance.
- The Water Supply and Distribution Program has not established a five-year financial plan.
- There are not any written policies and procedures for water distribution staff in the Water Supply and Distribution Program.
- A formal skills assessment and career development / training plan has not been developed for each employee.
- There is not a supervisory development program in the Water Supply and Distribution Program.

The strengths in Water Supply and Distribution Program Administration provide a sound basis to address these opportunities for improvement.

2. WATER SUPPLY AND DISTRIBUTION PROGRAM ORGANIZATIONAL STRUCTURE

There are a number of positive aspects to Water Supply and Distribution Program organizational structure. For example, there are only four managers and supervisors in the Program versus twenty-five workers and lead workers or a ratio of one manager or supervisor for every six workers and lead workers.

There are opportunities for improvement, however. These opportunities are presented below.

- There are two division heads for the Program: the Water Operations Manager and the Water Resource Manager.
- There are two Geographic Information System employees assigned to the Public Works Department to support, in part, the geographic information systems of the Water Supply and Distribution Program. One of these employees is located organizationally in the Information Technology Department and the other in the Public Works Department. Not only are two employees unnecessary, but there is

not any clarity in the accountability for the development and updating of the geographic information systems of the Water Supply and Distribution Program amongst the two employees.

The strengths in Water Supply and Distribution Program organizational structure provide a sound basis to address these opportunities for improvement.

3. ENGINEERING

There are a number of positive aspects to the Public Works Department Engineering Division as it affects the Water Supply and Distribution Program. Examples of these positive aspects are presented below.

- A water supply distribution master plan was developed, in 2002, that identifies needed infrastructure replacement requirements over the next five to ten years.
- The Engineering Division uses Microsoft Project and Primavera to schedule and manage capital projects. All staff of the Engineering Division have been trained in the use of Microsoft project.
- Project managers in the Engineering Division are responsible for quality control of capital improvement projects from “cradle to grave”.
- All conceptual planning and design is outsourced for all capital projects.
- The Engineering Division conducts 30% / 60% / 90% review for almost water utility capital projects with the managers and supervisors of the Water Supply and Distribution Program. Some projects are accelerated and may skip the 60% review.
- There is always a pre-construction meeting with contractors that includes the Project Manager, Inspector, Operations Division representative, contractor, and any significant subcontractors.

There are opportunities for improvement, however. These opportunities are presented below.

- The water supply distribution master plan is fourteen years old.
- A Gantt chart schedule has not been developed for water supply and distribution program capital improvement projects for a two to three-year period.

- The Engineering Division does not have a project management procedures manual.
- Engineering staffing or design consultants for design of capital projects is not based upon cost of construction guidelines.
- The Division does not estimate the resources needed for design, construction inspection / management, or project management for capital projects in the development of a project plan before the commencement of design.
- The Engineering Division does not prepare a written project plan that defines scope, schedule and budget for each capital project before the commencement of design
- The staff of the Engineering Division do not charge their time to capital projects using project time accounting.
- Project Managers have access to the Munis financial management system, but use spreadsheets to monitor the expenditures on each phase of projects. Each Project Manager uses Excel spreadsheets.
- A water supply and distribution program capital improvement project status report is prepared, but it does not include budget versus actual costs.
- The Engineering Division has not developed and does not utilize metrics for change orders as a % of the original construction contract, design as a % of construction, etc.
- The Engineering Division project manager is not typically notifying the Water Supply and Distribution Program of expiring warranties.

The strengths in Public Works Department Engineering Division provide a sound basis to address these opportunities for improvement.

4. GEOGRAPHIC INFORMATION SYSTEMS

There are a number of positive aspects to Public Works Department geographic information systems (GIS) as it affects the Water Supply and Distribution Program. Examples of these positive aspects are presented below.

- The City has acquired a GIS from ESRI.

- The Information Technology Department has two positions allocated to GIS: a GIS Integrator and a GIS Specialist. The Public Works Department also has a position allocated to GIS: a Civil Engineering GIS Specialist.

There are opportunities for improvement, however. These opportunities are presented below.

- GIS has yet to be fully deployed within the Water Supply and Distribution Program. Not all assets have been input into the GIS. For example, fire hydrants are approximately 95% to 98% complete, backflow prevention devices are approximately 55% complete, pressure reducing valves are approximately 20% complete, water distribution mains are approximately 55% complete, and water meters are approximately 97% complete.
- The GIS information developed for the Water Supply and Distribution Program is being maintained on a separate server than the Information Technology Department. As a consequence, there are two separate and dissimilar geodatabases for water infrastructure: one on a server maintained by the Information Technology Department and another maintained by the Public Works Department.
- The Information Technology Department has not established a citywide GIS steering committee.
- The Information Technology Department has not developed, in a written policy and procedure, a comprehensive set of data standards and inventory for the assets to be included in GIS (e.g., the granularity of data such as every block of a street versus every 0.25 mile of a block), and the referencing system (e.g. latitude and longitude versus milepoint along a street).
- The Information Technology Department has not established, by written policy, clear citywide roles in GIS that enable effective stewardship of City asset data.
- A citywide asset data maintenance / updating plan has not been established by the Information Technology Department.

The strengths in geographic information systems provide a sound basis to address these opportunities for improvement.

5. WATER SUPPLY AND DISTRIBUTION PROGRAM WATER QUALITY

One of the positive aspects to Water Supply and Distribution Program is the water quality. The Consumer Confidence Reports indicate that the City meets or better

water quality standards. The Water Supply and Distribution Program monitors water quality on a daily basis for low chlorine residuals, nitrification, and to ensure that bacteria levels are within expected ranges.

There are not any opportunities for improvement.

6. WATER CONSERVATION

There are a number of positive aspects to water conservation within the Water Supply and Distribution Program. Examples of these positive aspects are presented below.

- The City has adopted a water waste prevention ordinance.
- Customers can view their real time consumption if they sign up for Water Tracker on line. Meter mobile transmission units are being updated to provide more frequent information than the old mobile transmission units that provided 6 hour intervals. *Water Tracker* will also identify continuous flow issues, which could be indicative of a leak. Customers can get e-mails of unusual usage through the *Water Tracker* program as well.
- The City currently uses a tiered water rate structure with higher water usage falling in higher price tiers for residential customers.
- For May 2016, water consumption in the City of Beverly Hills decreased 23.74% compared to the 2013 baseline month, based upon reports to the State Water Resources Control Board.
- The unaccounted for water is reportedly about 7%.
- The City maintains a Permalog Leak Detection System. Permalog leak detection modules are placed on water valves in the distribution system; are placed in an area or quadrant of the distribution system and will cover a large area. The modules will listen for leaks at approximately 2:00 am and if they detect a leak they will listen again an hour later. The information is stored on the modules memory and later retrieved with a lap top computer, generally once a week. If a leak is discovered it will be scheduled for repair and the units left in place for another one to two weeks to see if any other leaks are detected before they are relocated.
- The City has hired a full time Conservation Coordinator who is responsible for the City's water conservation program including water system surveys, public

education on water conservation and the overall water conservation efforts of the City.

There are not any opportunities for improvement.

7. REVERSE OSMOSIS PLANT

There are a number of positive aspects to the reverse osmosis plant operated by the Water Supply and Distribution Program. Examples of these positive aspects are presented below.

- The Water Supply and Distribution Program is effectively implementing the recommendations contained in the 2014 Hazen and Sawyer report regarding the Reverse Osmosis Plant.
- A preventive maintenance program and checklist has been developed for the reverse osmosis treatment plant.
- A written Operations Maintenance and Monitoring manual has been developed for the reverse osmosis treatment plant.
- A water quality calibration and verification schedule has been established for the reverse osmosis plant analyzers, based on vendor recommendation and operational experience. This includes both a schedule of calibration and verification, and check sheets for each analyzer which are kept as a record.
- A formal written water quality management plan has been developed.
- A clear set of water quality targets, including water stability and total dissolved solids, have been documented in writing, listed in one place in the plant, so that the overall water quality requirements of the plant are clear.
- Water quality reports have been developed that document performance and are communicated to operations staff and management in the form of “dashboard”-style reports.
- A written sampling manual for sampling of the quality of the water produced by the reverse osmosis plant has been developed.
- Plant Operators collect water samples, and the Water Quality Specialist analyzes the samples and, if necessary, takes appropriate action. All compliance samples are tested by a third party, and the Water Quality Specialist receives the results and makes recommendations to the plant (e.g., one well produces arsenic at

more than 20 ppb, and must be blended with the production at other wells to reduce the concentration).

There are not any opportunities for improvement. While the operation of the reverse osmosis plant has been problematic in the past, the Water Supply and Distribution Program has taken and is taking corrective actions in concert with Hazen and Sawyer, a consulting firm retained by the City to guide these actions.

8. UTILITY BILLING

There are a number of positive aspects to the Administrative Services Department utility billing. Examples of these positive aspects are presented below.

- Rate studies are conducted by the Public Works Department in consultation with the Administrative Services Department. A consultant was employed in 2015 to prepare the latest rate study that incorporates tiered rates
- The Administrative Services Department uses the Munis financial management system, and downloads meter reads from the Aclara system.
- The City has a AAA bond rating from three rating agencies.
- The Public Works Department has access to the Munis financial management system, but the Administrative Services Department provides monthly financial reports monthly to the Public Works Department. The City has recently implemented "Open Gov" which allows users to drill down into any line item down to the individual transaction level.
- Customers can pay their utility bills on-line through an on line portal, residents may pay by credit card, EFT.
- The City employs an Advanced Metering Infrastructure – the Aclara STAR system - for meter reading.

There are opportunities for improvement, however. These opportunities are presented below.

- Web payments are only 15.1% of the total payments by number, and 13.5% by dollar amount.

- On-line customers are not offered multiple options for e-mail notifications (billing notice, bill reminder, payment confirmation, etc.).
- The number of days until Final Notice (From Bill Mail Date) is 60 calendar days.
- The number of days until Suspension of Service (From Bill Mail Date) is less than 70 calendar days.
- Late payment notifications and/or impending service disconnection notifications are not automated (letters or phone calls).
- Bad debt reserves were 1.49% of revenues in FY 2014-15.
- The City's call management system does not capture data that would allow a comparison to metrics regarding the % of calls received from water utility customers that are answered within 20 seconds, 30 seconds, and 60 seconds, or the % of calls abandoned as a % of total calls.

The strengths in utility billing provide a sound basis to address these opportunities for improvement.

8. WATER SUPPLY AND DISTRIBUTION PROGRAM ASSET MANAGEMENT

There are a number of positive aspects to the Water Supply and Distribution Program asset management. For example, a complete and updated geodatabase inventory has been developed for some of the assets maintained and repaired such as the sanitary sewer collection system. As another example, the Public Works Department does conduct condition assessments for some of the assets assigned to its care such as the City's streets (e.g., the pavement condition index).

There are opportunities for improvement, however. These opportunities are presented below.

- The City has not developed and adopted an asset management policy.
- Some of the assets lack a complete and up-to-date geodatabase inventory and a GIS system maps such as the Water Supply and Distribution Program.

- The asset registry is not complete and updated as new assets are placed into service and old ones disposed of. This is certainly the case for the Water Supply and Distribution Program.
- A written policy and procedure has not been developed for the continuous updating of the asset inventory.
- The Public Works Department has not developed formal written “useful lives” for the assets assigned to its care and documented within the asset registry.
- The Public Works Department has not defined the levels of service necessary to sustainably (lowest life-cycle cost) maintain the assets.
- The Public Works Department does not report on an annual basis the state of asset management and preservation
- The Public Works Department has not designated an “asset manager”.
- The Public Works Department does not track progress in achieving the system-wide master plan and communicates this progress.
- A five-year capital improvement program for the implementation of the water system-wide master plan has not been developed.
- 1% to 2% of water mains are not replaced annually. No water mains have been replaced for the past two to three years.

The strengths in asset management provide a sound basis to address these opportunities for improvement.

9. WATER SUPPLY AND DISTRIBUTION PROGRAM COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

There are a number of positive aspects to Water Supply and Distribution Program computerized maintenance management system (Hansen). For example:

- The reverse osmosis treatment plant has an Operations and Maintenance Manual that describes the operating characteristic so the reverse osmosis plant process flow, system safety, process controls, monitoring and sampling, chemical storage and handling, as well as troubleshooting procedures.
- All work completed by the field maintenance and repair crews in the Water Supply and Distribution Program are input into the computerized maintenance

management system. These work orders include labor, materials, supplies, equipment used, and contract labor.

There are opportunities for improvement, however. These opportunities are presented below.

- The field maintenance and repair crews in the Water Supply and Distribution Program have not developed standard operating policies and procedures.
- Work is not formally planned and scheduled on a week-by-week basis. There are no programmed activities in the field maintenance and repair crews in the Water Supply and Distribution Program. Most work is performed in a reactive manner, and not scheduled although the valve turning program is an exception.
- The staff of the reverse osmosis treatment plant record all work activities manually in a daily log, and not in the computerized maintenance management system.
- The field maintenance and repair crews in the Water Supply and Distribution Program utilize the computerized maintenance management system to record work performed, locations, hours spent, materials and equipment used. The data, however, is limited in their value, as work activities are not standardized (e.g., different crews record what work activities are performed in different ways).
- The Water Supply and Distribution Program is not utilizing mobile technologies for the computerized maintenance management system.
- The computerized maintenance management system is not populated with pre-determined preventive maintenance work activities including the frequency of these activities.
- Given the variance in the way work activities are recorded, it is not possible to generate monthly reports from the computerized maintenance management system that document the types of work activities performed, the labor hours expended in these activities, the productivity of staff, the work output, the cost per unit of work, etc.
- The computerized maintenance management system is used as a maintenance management system to manage service levels, work activities, productivity, unit costs, etc.

The strengths in the computerized maintenance management system provide a sound basis to address these opportunities for improvement.

10. WATER SUPPLY AND DISTRIBUTION PROGRAM PREVENTIVE MAINTENANCE

There are a number of positive aspects to Water Supply and Distribution Program preventive maintenance program. For example:

- Water pump stations are checked daily by Water Worker III's from the reverse osmosis treatment plant.
- The crew sizes utilized for water operations and distribution are appropriate to the work performed:
- Cla-valve preventive maintenance is accomplished with a two-person crew;
- Valve turning is accomplished with a one-person crew;
- Main break repair is accomplished, typically, with a 3-person crew unless unusually large;
- Water service replacement is accomplished with a 3-person crew;
- Fire hydrant repair is accomplished with a 3-person crew;
- Underground service alert (blue staking) is accomplished with a 1-person crew.
- With respect to access to water utility infrastructure or property, measures are in place to protect the property and facilities from unauthorized entry or activity. The water utility infrastructure has supervisory control and data acquisition, and reservoirs have cameras at gates and doors, with key cards required for entry. Treatment plant operators monitor cameras at all reservoir locations. Pump stations also have cameras to monitor the security of these locations.
- Based upon the data provided by Public Works GIS, it appears as if the rate of water main breaks was approximately 11.7 breaks per 100 miles of main in 2014 and 8.2 per 100 miles of main in 2015.

There are opportunities for improvement, however. These opportunities are presented below.

- The Water Supply and Distribution Program has not installed a robust preventive maintenance program that complies with American Water Works Association standards.

- The Water Supply and Distribution Program has not installed a predictive testing and inspection program (e.g., thermographic imaging, vibration analysis, ultrasonic analysis, oil analysis, laser alignment and dynamic balancing etc.) for mechanical components in pump and booster stations.
- Preventive maintenance activities are not managed through the computerized maintenance management system.
- Formal, written preventive maintenance plans or guidelines have not been established for the field maintenance and repair crews in the Water Supply and Distribution Program.
- The Program does not preventively maintain the City's 1,200 fire hydrants. It only replaces hydrants as they are damaged or destroyed.
- Air release valves are not checked on a bi-annual basis, and valves are preventively maintained and rebuilt if necessary.
- Pressure relief valves (Cla-valves) are not checked annually, preventively maintained, and rebuilt if necessary.
- A multi-family water meter change out program has not been established for water meters 1.5 " to 2" that results in these meters being changed out on a four-year schedule.
- A water meter registration accuracy-testing program has not been installed for 3", 4", and 6" meters that result in these meters being field tested on a one-year schedule.
- A comprehensive backflow prevention program has not been established. Whether businesses are in compliance with State requirements for testing backflow prevention devices is unknown.

An organizational and management analysis, by its nature, focuses on opportunities for improvement. However, there are a number of strengths in the Water Supply and Distribution Program.

4. ANALYSIS OF INDIRECT COST ALLOCATION

The Matrix Consulting Group conducts cost allocation studies for local governments. We have conducted such studies for local governments in the United States such as the cities of Austin, Texas; Fort Lauderdale, Florida; Elk Grove, California; San Mateo, California; Vacaville, California; Fairfield, California; South Gate, California; and Asheville, North Carolina. This includes local governments with their own water utilities. In Los Angeles County, this has included the cities of Long Beach, Manhattan Beach, and Pasadena.

The analysis of the City's cost allocation plan and resulting indirect charges to the Water Supply and Distribution Program for goods and services provided by other City departments evaluated the methodologies used, the basis for these charges, and resulted in recommendations to adjust the indirect charges to the Water Supply and Distribution Program.

1. THE CITY HAS DEVELOPED A CITYWIDE COST ALLOCATION PLAN

A Cost Allocation Plan is an accounting report that spreads costs from central support departments (e.g., HR and Finance) to those departments, divisions, cost centers, and/or funds that receive services in support of conducting their operations. In doing so, an organization can both better understand the full cost of providing specific services, and also generate organizational awareness regarding indirect (overhead) costs associated with operations. Cost Allocation Plans can vary from jurisdiction to jurisdiction, however, they should contain the following components:

- **Compiled in accordance with Generally Accepted Accounting Principles:** The GAAP are a common set of accounting principles, standards and procedures that are used to compile financial statements. GAAP are a combination of

authoritative standards (set by internal policy) and simply the commonly accepted ways of recording and reporting accounting information.

- **Adhere to a double-step down methodology:** This methodology ensures that the benefit of services between central support departments are recognized first, before final allocations to receivers of services are made. For example, in the first step, central service department expenditures are allocated to other central service departments such as HR, IT, etc., as well as to receiving funds or departments. The second step distributes central service department expenses and first step allocations to the receiving departments only.
- **Costs included should be necessary and reasonable:** Actual or budgeted expenditures associated with a department or division included for cost allocation should be solely that of the department, and should not include one time expenditures, or expenditures associated with services that do not relate to services being provided to receiving departments. Examples of expenditures that should not be included in cost allocation plans include: Election Costs, Lobbying Costs, or litigation costs.
- **Allocation methodologies should relate to the service being received:** Statistics used to allocate costs should reflect the level of service being provided by a given department. For example, when allocating payroll costs, the use of full time employees could be used as a metric, as the more employees a department has, the more payroll services are being provided. It should be noted, sometimes statistics need to be modified in order to accurately portray the level of service being provided. Continuing with the payroll example, if Police and Fire require a higher level of service due to additional reporting or benefits, the agency may need to weight the full time employee statistic to reflect accurate service levels.
- **Adequately documented:** A cost allocation plan should have a narrative describing the methodology used to allocate each cost factor, including the type of metric used, the timeframe associated with the metric, and the source of the metric.
- **Periodic reviews and updates:** A cost allocation plan, if not updated annually, should be periodically updated either internally or by an outside agency every three to five years. Periodic updates ensure that the costs being allocated are still reflective of the services being provided, and account for changes in organizational structure, or budgeted or actual expenses. The use of an outside agency to review a cost allocation plan provides an impartial evaluation of methodology.

The City has developed Internal Service Funds (ISF) in order to account for operations that provide services to multiple City departments and funds. By creating

these ISFs, the City is able to provide more efficient and lower cost services, and track costs and bill users with a break-even motive. The costs allocated to departments in association with ISFs account for budgeted direct and indirect expenditures for a given fiscal year.

The City currently develops an internal Cost Allocation Plan annually to coincide with the budget cycle in order to spread ISF costs to all City departments and funds. For each fund being allocated a specific driver or drivers are determined to allocate costs appropriately. Examples of allocation drivers include:

- Number of Full Time Employees per Fund and Department
- Size of Operating Budget per Fund and Department
- Number of Computers per Fund and Department
- Actual service expenditures per Fund and Department

2. THE CITY HAS A NUMBER OF INTERNAL SERVICE FUNDS

The City currently has 8 Internal Service Funds (ISF) which account for 20 types of service categories. The following table outlines the current Internal Service Funds, and a brief description of the services or costs accounted for in each.

Internal Service Fund	Services Provided
Equipment Replacement	Replacement of equipment after their useful life.
Capital Assets	Care and maintenance of City facilities, vehicles, and related equipment.
Information Technology	Replacement of IT hardware, software, and radio equipment.
Cable / Television	Video programming associated with public information, education, and outreach.
Reprographics / Graphics	Printing, mail, and graphic design services.
Liability	Self-insured general liability services and claims.
Policy, Admin, Legal	Services provided by support departments such as Policy, Administrative, and legal.
Vehicle	Acquisition, maintenance, and repair of vehicles and related equipment.

Of the 20 services accounted for in the City’s Internal Service Fund allocations, the Water Supply and Distribution Program is assessed costs for 16 categories. The following sub-sections provide further detail regarding the services and costs assessed to the Water Supply and Distribution Program for Fiscal Year 16-17.

(2.1) Capital Assets

The Capital Assets Fund (405) includes two separate chargeback accounts: Facilities Maintenance (Operations) and Facilities Replacement (Capital Improvement). Facilities Maintenance allocations account for services such as housekeeping, utilities, security services, structural, and preventive maintenance of City buildings. Facilities Replacement allocations account for upcoming fiscal year replacement costs associated with City facilities as needs arise. The budgeted FY 16-17 direct and indirect costs associated with Facilities Maintenance and Replacement are \$13,173,298 and \$11,585,820 respectively. The following table details the allocations assessed to the Water Supply and Distribution Program for Capital Assets by functional area.

Functional Area	Facilities Maintenance	Facilities Replacement	Total
Groundwater	\$50,343	\$49,627	\$99,969
Maintenance and Repair	\$230,021	\$116,236	\$346,257
Water Quality	\$57,503	\$56,685	\$114,187
Water Services & Install	\$86,814	\$85,578	\$172,392
Water Conservation	\$10,292	\$10,146	\$20,438
Fire Suppression	\$3,132	\$3,088	\$6,220
TOTAL	\$438,105	\$321,360	\$759,464

The \$438,105 assessed to the Water Supply and Distribution Program for Facilities Maintenance accounts for 3.24% of the overall costs associated with Facilities Maintenance. The \$321,360 allocated for Facilities Replacement accounts for 2.77% of costs.

(2.2) Information Technology

The Information Technology Fund (410) includes three chargeback accounts: IT Operations, IT Replacement, and Radio Communications. IT Operations allocations account for costs associated with use of the City’s network, computers, software, hardware, and specialized professional services. IT Replacement allocations account for upcoming fiscal year replacement costs associated with software, hardware, and network needs. Radio Communication allocations account for costs associated with maintaining portable radio units used by City departments. The following table details the allocations assessed to the Water Supply and Distribution Program for Information Technology by functional area.

Functional Area	IT Operations	IT Replacement	Radio	Total
Groundwater	\$24,783	\$18,195	\$-	\$42,977
Maintenance and Repair	\$56,614	\$43,244	\$-	\$99,859
Water Quality	\$28,156	\$20,783	\$-	\$48,938
Water Services & Install	\$49,887	\$31,376	\$51,267	\$132,530
Water Conservation	\$25,724	\$3,720	\$-	\$29,444
Fire Suppression	\$2,542	\$1,132	\$-	\$3,675
TOTAL	\$187,706	\$118,450	\$51,267	\$357,422

As shown in the table above, while all of the Water Supply and Distribution Program’s departments receive allocations for IT Operations and IT Replacement, only the Water Services & Install department receives Radio allocations. The Water Supply and Distribution Program receives 2.24% of the direct and indirect costs associated with IT Operations (\$8,368,320), 3.92% of IT Replacement (\$3,019,400), and 2.83% of Radio costs (\$1,810,401).

(2.3) Cable Television

The Cable TV Fund (420) accounts for services associated with video programs informing and educating the public about department specific issues and outreach initiatives. Costs allocated through this fund relate to development, videotaping, and editing of completed programs. Only the Water Conservation department receives an allocation (\$18,052) from the Cable TV Fund, representing 1.98% of direct and indirect costs.

(2.4) Reprographics / Graphics

The Reprographics / Graphics Services Fund (430) includes two separate chargeback accounts: Print Shop and Graphic Arts. Print Shop costs represent costs associated with in-house printing jobs, multi-function device lease rates and per impression costs and metered postage. Graphic Arts costs reflect promotional and informational materials produced for departments. The budgeted FY 16-17 direct and indirect costs associated with Print Shop and Graphic Arts are \$1,403,668 and \$1,148,456 respectively. The following table details the allocations assessed to the Water Supply and Distribution Program for Reprographics / Graphics by functional area.

Functional Area	Print Shop	Graphic Arts	Total
Groundwater	\$-	\$-	\$-
Maintenance and Repair	\$1,220	\$-	\$1,220
Water Quality	\$6,453	\$4,594	\$11,047
Water Services & Install	\$1,720	\$5,742	\$7,462
Water Conservation	\$7,953	\$57,423	\$65,376
Fire Suppression	\$-	\$-	\$-
TOTAL	\$17,346	\$67,759	\$85,105

Overall, the Water Supply and Distribution Program is assessed \$85,105 for Print Shop and Graphic Arts services, representing 3.33% of associated direct and indirect costs.

(2.5) Liability Fund

The Liability Fund (450) represents costs associated with payment of self-insured general liability. The total direct and indirect costs associated with this fund for FY 16-17 is \$6,252,016. The following table outlines the allocations assessed to the Water Supply and Distribution Program by department.

Functional Area	Liability Fund
Groundwater	\$90,910
Maintenance and Repair	\$212,930
Water Quality	\$103,839
Water Services & Install	\$156,768
Water Conservation	\$18,586
Fire Suppression	\$5,657
TOTAL	\$588,690

The Water Utility Fund is allocated \$588,690 for Liability and Workers' Compensation, which represent approximately 9.42% of direct and indirect costs.

(2.6) Policy, Administration, Legal

The Policy, Administrative, and Legal (PAL) Fund (480) includes the following departments: Policy & Management, Administrative Services, City Attorney's Office, City Clerk, divisions of Public Works Administration, Capital Assets Administration, Real Estate and Property Management, Project Administration, and CIP Management and Inspection. The following points outline the services and costs associated with each of these departments:

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- **Policy & Management:** Services provided by the City Council, Administrative Support, Communications and Marketing, Economic Sustainability, and Emergency Management.
- **Administrative Services:** Includes Accounting, Purchasing, Cashiering, Utility Billing, AP, AR, Budget, Human Resources, Personnel and Benefits management, Labor Relations, and Employee Recruitment and Recognition.
- **Legal Service:** Services provided by the City Attorney’s office, including contract review, general legal advice, and litigation.
- **City Clerk:** Services including Records keeping, records management and retention, processing public records requests, and maintain compliance with state and local codes.
- **Public Works:** Services provided by Public Works Administration, City-Wide Governance, and the Public Works Customer Service divisions.

Services and costs associated with Capital Assets Administration, CIP Management and Inspection, Project Administration, and Real Estate and Property Management were not allocated to the Water Supply and Distribution Program. The following table outlines the allocations assessed to the Water Supply and Distribution Program by department.

Functional Area	Policy & Management	Admin Services	Legal Services	City Clerk	PW Admin	TOTAL
Groundwater	\$108,289	\$307,439	\$95,854	\$26,826	\$231,952	\$770,360
Maintenance and Repair	\$253,638	\$720,090	\$122,128	\$62,832	\$543,283	\$1,701,971
Water Quality	\$123,690	\$351,164	\$98,638	\$30,641	\$264,940	\$869,073
Water Services & Install	\$186,739	\$530,161	\$110,035	\$46,260	\$399,988	\$1,273,183
Water Conservation	\$22,139	\$62,854	\$4,002	\$5,484	\$47,421	\$141,901
Fire Suppression	\$6,738	\$19,130	\$1,218	\$1,669	\$14,433	\$43,187
TOTAL	\$701,233	\$1,990,838	\$431,874	\$173,713	\$1,502,017	\$4,799,675

Allocations attributed to the Water Supply and Distribution Program for Policy, Admin, and Legal services total \$3,123,946 for FY 16-17 and represent the majority

(65%) of the overall costs allocated to the program. The \$1.9 million in Administrative Services costs allocated to the Water Supply and Distribution Program account for approximately 26.72% of allocated ISF costs, while the \$1.5 million allocated from Public Works Administration reflects 20.16% of allocated costs.

(2.7) Vehicle

The Vehicle Fund (490) includes two separate chargeback accounts: Vehicle Operations and Vehicle Replacement. Vehicle Operations allocations account for maintenance and repair of City vehicles and equipment. Vehicle Replacement allocations account for upcoming fiscal year replacement costs associated with City vehicles as needs arise. The budgeted FY 16-17 direct and indirect costs associated with Vehicle Operations and Replacement are \$5,382,914 and \$3,851,984 respectively. The table on the following page details the allocations assessed to the Water Supply and Distribution Program for Vehicles by functional area.

Functional Area	Vehicle Operations	Vehicle Replacement	Total
Groundwater	\$3,254	\$-	\$3,254
Maintenance and Repair	\$447,658	\$234,733	\$682,392
Water Quality	\$8,712	\$3,427	\$12,140
Water Services & Install	\$13,116	\$294	\$13,410
Water Conservation	\$-	\$-	\$-
Fire Suppression	\$-	\$-	\$-
TOTAL	\$472,740	\$238,455	\$711,195

The \$472,740 assessed to the Water Supply and Distribution Program for Vehicle Operations accounts for 8.78% of direct and indirect costs. The \$238,455 allocated for Vehicle Replacement accounts for 6.19% of costs. No Vehicle Fund costs were allocated to Water Conservation or Fire Suppression.

(2.8) Public Works Administration Building Lease

The Public Works Administration Building (PWAB) lease chargeback (759700) reflects the rental charges for use of the Public Works Administration Building. The total direct costs associated with the lease for FY 16-17 is \$1,044,233. The following table outlines the allocations assessed to the Water Supply and Distribution Program by department.

Functional Area	PW Admin Building Lease
Groundwater	\$20,197
Maintenance and Repair	\$47,306
Water Quality	\$23,070
Water Services & Install	\$34,829
Water Conservation	\$4,129
Fire Suppression	\$1,257
TOTAL	\$130,788

The Water Enterprise Fund owns the Public Works Administration Building, and its inclusion in the allocation is to ensure that all occupants are fairly assessed their portion of lease costs. All revenues generated by occupants, including the \$130,788 allocated to the Water Utility Fund, are paid in full to the Water Enterprise Fund.

(2.9) Summary of Indirect Cost Allocations to the Water Enterprise Fund

Overall, the City of Beverly Hills is allocating a total of \$7,450,391 to the Water Utility Fund for FY 16-17. The following exhibit summarizes these allocations by functional area. As the exhibit shows, the Maintenance and Repair division within the Water Supply and Distribution Program receives the majority of the total costs being allocated to the program (\$3,091,935). Both Administrative Services and Public Works Administration allocate the most cost to the program with \$1.9 million and \$1.5 million respectively.

Summary of Indirect Cost Allocations to the Water Enterprise Fund

Functional Area	Ground-water	Maintenance and Repair	Water Quality	Water Services & Install	Water Conservation	Fire Suppression	Total
Facilities Maintenance	\$50,343	\$230,021	\$57,503	\$86,814	\$10,292	\$3,132	\$438,105
Facilities Replacement	\$49,627	\$116,236	\$56,685	\$85,578	\$10,146	\$3,088	\$321,360
IT Operations	\$24,783	\$56,614	\$28,156	\$49,887	\$25,724	\$2,542	\$187,706
IT Replacement	\$18,195	\$43,244	\$20,783	\$31,376	\$3,720	\$1,132	\$118,450
Radio	\$-	\$-	\$-	\$51,267	\$-	\$-	\$51,267
Cable TV	\$-	\$-	\$-	\$-	\$18,052	\$-	\$18,052
Print Shop	\$-	\$1,220	\$6,453	\$1,720	\$7,953	\$-	\$17,346
Graphic Arts	\$-	\$-	\$4,594	\$5,742	\$57,423	\$-	\$67,759
Liability Fund	\$90,910	\$212,930	\$103,839	\$156,768	\$18,586	\$5,657	\$588,690
Policy & Management	\$108,289	\$253,638	\$123,690	\$186,739	\$22,139	\$6,738	\$701,233
Admin Services	\$307,439	\$720,090	\$351,164	\$530,161	\$62,854	\$19,130	\$1,990,838
Legal Services	\$95,854	\$122,128	\$98,638	\$110,035	\$4,002	\$1,218	\$431,874
City Clerk	\$26,826	\$62,832	\$30,641	\$46,260	\$5,484	\$1,669	\$173,713
PW Admin	\$231,952	\$543,283	\$264,940	\$399,988	\$47,421	\$14,433	\$1,502,017
Vehicle Operations	\$3,254	\$447,658	\$8,712	\$13,116	\$-	\$-	\$472,740
Vehicle Replacement	\$-	\$234,733	\$3,427	\$294	\$-	\$-	\$238,455
PW Building	\$20,197	\$47,306	\$23,070	\$34,829	\$4,129	\$1,257	\$130,788
Total	\$1,027,667	\$3,091,935	\$1,182,294	\$1,790,574	\$297,925	\$59,996	\$7,450,391

3. THE CITY'S METHODOLOGY FOR INDIRECT COST ALLOCATION MEETS BEST PRACTICES, EXCEPT FOR THE INCLUSION OF THE COST OF PURCHASED WATER.

The Matrix Consulting Group assessed the City's cost allocation methodology in order to determine if it was fair and equitable to the Water Supply and Distribution Program. In order to provide this analysis, two key cost components of the City's current cost allocation model were reviewed:

- **Cost Allocation Model** – How does the City's model compare to those used by independent agencies to allocate costs?
- **Cost Allocation Methodology** – Do the costs included, and the methodologies utilized reflect the services being provided?

The following subsections discuss the analysis and results of the assessment of the City of Beverly Hills' current cost allocation model.

(3.1) Analysis of Cost Allocation Model

The City of Beverly Hills currently uses an Excel-based model to calculate its cost allocation plan. This model was developed in-house over 10 years ago, and is updated annually by Finance staff. The model consists of the following components.

- **Summary Tab:** This tab summarizes the allocations to receivers from central services.
- **Detail Tabs:** Each central service fund or cost center has its own tab that identifies the costs being allocated by Org number. These tabs also show the statistic or percentage being used to allocate costs across all receivers.
- **Notes Tab:** This tab provides instructions to Finance staff regarding what information needs to be included in the model, and in what order information needs to be input.

In addition to the Excel-based model, for the FY 2016-17 budget cycle, the City has developed an *Internal Service Fund Charges Manual* that "is designed as a users' guide to... explain Internal Services Fund charges and the methodologies used to

calculate them, in an effort to provide greater clarity and confidence in the methods and purpose of such charges”. This manual discusses what each ISF is and the services it provides; a historical perspective of why the City allocates costs through this method; a discussion of the fundamentals of how the model is used by the City; and a discussion of how each ISF is allocated.

(3.1.1) Comparison of Cost Allocation Model to Industry Standards

When reviewing the City’s Excel-based model, the Matrix Consulting Group focused on two mechanisms found in all industry standard cost allocation models: 1) the use of a double step-down methodology; and 2) cross checks that ensure accurate allocation of costs. The inclusion of these two mechanisms in any model is key to ensuring that the costs allocated are accurate and fair, and represent no more, and no less than the total costs included for allocation.

As discussed earlier, the double-step down methodology ensures that Central Services are first included in the over-all allocation of support costs, and then secondly allocate those costs accurately to remaining receivers. The City’s Microsoft Excel-based cost allocation plan allocates incoming costs associated with central services utilizing Excel’s iterative circular calculation function. This approach is different from the standard cost allocation plan model utilized by the Matrix Consulting Group, but works effectively as a basis to allocate indirect costs.

In order to illustrate the impacts of properly accounting for central service indirect costs, and the need for an accurate double step down methodology, the Matrix Consulting Group took the FY 16-17 costs allocated through the City’s current model, along with the allocation methodologies and ran them through their industry standard

model. The following table provides a comparison of the charges assessed to the Water Supply and Distribution Program based on the City’s current model, and that of the Matrix Consulting Group.

Internal Service Fund	Current	Matrix Model	Difference
Facilities Maintenance	438,105	432,721	\$5,383
Facilities Replacement	\$321,360	\$321,360	\$-
IT Operations	\$187,706	\$169,048	\$18,658
IT Replacement	\$118,450	\$136,026	\$(17,577)
Radio	\$51,267	\$58,885	\$(7,618)
Cable TV	\$18,052	\$17,226	\$825
Reprographics	\$85,105	\$74,136	\$10,969
Liability Fund	\$588,690	\$588,510	\$179
Policy & Management	\$701,233	\$705,687	\$(4,453)
Admin Services	\$1,990,838	\$1,998,192	\$(7,354)
Legal Services	\$431,874	\$441,408	\$(9,534)
City Clerk	\$173,713	\$175,738	\$(2,025)
PW Admin	\$1,502,017	\$1,514,423	\$(12,406)
Vehicle Operations	\$472,740	\$473,585	\$(845)
Vehicle Replacement	\$238,455	\$238,455	\$-
PW Building	\$130,788	\$130,788	
Total	\$7,450,391	\$7,476,188	\$(25,797)

As the table above shows, the City’s current model is allocating approximately \$25,800 less to the Water Supply and Distribution Program than would be allocated by the mode used by the Matrix Consulting Group. However, the difference in overall allocation between the two models is less than half a percent (0.35%); the difference is immaterial. The City’s current cost allocation model functions effectively to allocate indirect costs among the City’s various funds.

(3.2) Review of Allocation Methodologies

While the mechanisms associated with a model are important to the fairness and

equitability required of cost allocation plans, the metrics used to allocate costs are also vital to ensuring accurate allocations. Therefore, the Matrix Consulting Group reviewed the metrics currently being used by the City to allocate costs associated with each ISF. The following table identifies the metric used by each ISF to allocate costs.

Internal Service Fund	Method of Allocation
Equipment Replacement	Cost of Replacement
Facilities Replacement	FTE and Occupancy Load
Vehicle Replacement	Cost of Replacement
Facilities Maintenance - General	FTE and Occupancy Load
Facilities Maintenance - Special	Identified Support
IT Admin	Identified Chargeback and Replacement Costs
Cable TV	Percent of Video requests and direct charges associated with Time Warner billings
Reprographics	Percent of graphic and print requests, identified postage usage, and Xerox lease
Liability	Split of # of Claims, value of claims, and overall budget
Public Works Admin	FTE
Policy & Management	Budget and FTE
Administrative Services	Budget and FTE
Legal Services	Budget and Identified Support
Clerk	Budget and FTE
Capital Assets	FTE
Vehicle Operations	Ratio of Fuel, Parts, and Labor costs
Public Works Admin Building	Percentage of lease charges

The most common statistics used by the City to allocate costs are budget and FTE. While some of the ISFs are able to use multiple statistics to allocate costs, such as Reprographics and Cable TV, other ISFs utilize singular statistics such as size of operating budget or number of full time employees.

When comparing the information in the City's *Internal Service Fund Charges Manual* regarding the metrics used to allocate costs to the metrics being used in the City's model, the Matrix Consulting Group noted one consistent discrepancy. The *Internal Service Fund Charges Manual* states that costs are spread to receivers based

on the number of full time employees per program, however, when reviewing these statistics within the City’s model, it appears that costs with this allocation basis are actually spread to funds based on budget size, and then spread within each fund based on the number of full time employees. The following table illustrates the impact of allocating costs using full time employees versus budgeted expenditures.

	# of FTE	% of Allocation	Budget	% of Allocation
Water	36	4.95%	\$36,922,629	9.30%
All Others	699		\$360,080,826	
Total	735		\$397,003,455	

The current methodology used by the City to allocate services such as Policy & Management, Administrative Services, and Clerk sends approximately 9.3% of all costs to the Water Supply and Distribution Program, whereas the use of full-time employees would yield only 4.95% of all costs.

Recommendation #4: The City should either update its cost allocation plan manual to reflect how costs are being allocated in the cost allocation model, or alter the methodology used in the model to reflect the description currently shown in the manual.

(3.2.1) Nexus of Allocation Metrics to Services Being Provided

In reviewing the metrics used by the City to allocate costs, a majority had a strong nexus to the services they were meant to allocate. Examples of this include the use of actual costs to allocate equipment and facilities replacement costs, as well as the use of the number and amount of claims when allocating Liability and Workers’ Compensation costs. The greater the nexus between a metric and the service being provided, the fairer and more equitable a cost allocation methodology is.

When looking at the City’s use of budget as a metric of allocation in its current model, the Matrix Consulting Group noted that the budget number used includes the

cost of purchased water. The use of budget is a common metric used to allocate costs associated with various departments or programs, as the thought process is usually that the bigger the budget, the more services or support are required. For example, when looking at Finance services, the bigger a department's operating budget, the more likely they are to need support related to financial reporting, transactional assistance (AP / AR), or auditing services. The Matrix Consulting Group does not include the cost of purchased water in its cost allocation plans for cities with their own water utilities; the cost of purchased water was not included in the plans developed for the cities of Long Beach, Pasadena, or Manhattan Beach.

The cost of purchased water, as a cost driver within the Water Supply and Distribution Program, do not necessitate the need for additional services. The Water Supply and Distribution Program purchases water annually for a fixed amount, in FY 15-16 this amount was \$10,379,073. This line item expenditure does not create proportionately more financial reporting requirements, transactions, or auditing services. As such, high dollar value line items, such as the purchase of water, which have no direct correlation to the service being allocated, should be excluded from the allocation metric. In order to show the impact of excluding the purchase of water from the allocation methodology, the Matrix Consulting Group ran a cost allocation scenario utilizing its industry standard model whereby the cost of purchased water was excluded from allocation metrics based on budget.

Internal Service Fund	Current	MCG No Water	Difference
Facilities Maintenance	\$438,105	\$435,006	\$3,099
Facilities Replacement	\$321,360	\$321,360	\$-
IT Operations	\$187,706	\$169,359	\$18,347
IT Replacement	\$118,450	\$136,278	\$(17,828)

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Internal Service Fund	Current	MCG No Water	Difference
Radio	\$51,267	\$58,994	\$(7,727)
Cable TV	\$18,052	\$17,326	\$726
Reprographics	\$85,105	\$74,411	\$10,693
Liability Fund	\$588,690	\$674,252	\$(85,562)
Policy & Management	\$701,233	\$523,340	\$177,894
Admin Services	\$1,990,838	\$1,745,165	\$245,673
Legal Services	\$431,874	\$410,463	\$21,412
City Clerk	\$173,713	\$130,326	\$43,387
PW Admin	\$1,502,017	\$1,528,005	\$(25,988)
Vehicle Operations	\$472,740	\$478,090	\$(5,350)
Vehicle Replacement	\$238,455	\$238,455	\$-
PW Building	\$130,788	\$130,788	\$-
Total	\$7,450,391	\$7,071,617	(\$378,774)

As the table above shows, the City's current model is allocating approximately \$378,774 more to the Water Supply and Distribution Program by including the cost of purchased water in the budget allocation metrics. This difference represents approximately 5.08% of the total costs currently being allocated to the Program.

The Administrative Services Department believes that the cost of purchased water should be included in the cost allocation plan. The Department believes that the higher the item's cost, the greater the scrutiny given to the item. In addition, water purchases and sales were a major driver of staff time given water rate studies, conservations programs, penalty surcharge programs along with the related appeals process, etc.

However, the City's cost allocation plan allocates \$4.6 million in indirect charges to the Water Supply and Distribution Program for Policy and Management, Administrative Services, Legal Services, and Public Works Administration. This \$4.6 million exceeds the 2014-15 costs of salaries and benefits for the positions allocated to

the Water Supply and Distribution Program. In the perspective of the Matrix Consulting Group, more than sufficient indirect costs have been allocated to the Water Supply and Distribution Program for water purchases and sales, water rate studies, conservations programs, penalty surcharge programs along with the related appeals process, etc.

The cost of purchased water should be excluded from the City's budget allocation metrics in the City's cost allocation model. This is the same approach that the Matrix Consulting Group makes in the development of cost allocation plans for other cities with municipal water utilities such as Pasadena, Manhattan Beach, and Long Beach.

However, before the Administrative Services Department makes this adjustment, the Administrative Services Department should report back to the Office of the City Manager and the City Council regarding the implications of this adjustment to other funds. Clearly, if this change in methodology is applied only to the Water Enterprise Fund, allocation of costs would need to be increased for other funds to compensate for that reduction.

Recommendation #5: The cost of purchased water should be excluded from the City's budget allocation metrics in the City's cost allocation model. However, before the Administrative Services Department makes this adjustment excluding the cost of purchased water from the City's budget allocation metrics in the City's cost allocation model, the Administrative Services Department should report back to the Office of the City Manager and the City Council regarding the implications of this adjustment to other funds. Clearly, if the allocation of indirect costs is reduced for the Water Enterprise Fund, the allocation of costs will need to be increased for other funds to compensate for that reduction.

5. ANALYSIS OF ASSET MANAGEMENT

Asset management focuses on the facts about the infrastructure assets, their performance, their preservation, and their anticipated longevity. Effective asset management in Beverly Hills is important for a number of reasons as noted below.

- The value of the Water Supply and Distribution Program's assets is significant. The City's CAFR for FY 2015 indicated that the value of the water enterprise fund assets amounted to \$168.8 million.
- The Water Supply and Distribution Program's infrastructure is aging, and, in some cases, it exceeds its life span.
- The extent of asset renewal and rehabilitation for the Water Supply and Distribution Program has been insufficient in some aspects.
- The risks and liability posed by aging infrastructure are significant.
- The safety and serviceability of assets is an increasing challenge.

Effective asset management uses accurate asset information to enable decisions regarding condition, performance, and other needs with a long-term view of the preservation and renewal of these assets.

The American Public Works Association has developed a *Guidance Position Statement for Public Works Infrastructure Asset Management*.⁵ The Statement of Position states, "*The American Public Works Association is committed to the principle that public works facilities and their management organizations are valuable assets and should be managed to provide the highest possible return on the public's investment. Reliable Public Works are crucial to a safe, healthful, and productive civil society. Each generation inherits the complex system of infrastructure that facilitates these services,*

⁵ Guidance Position Statement for Public Works Infrastructure Asset Management, American Public Works Association, 2003

develops and operates this system to meet our current demands and aspirations, and then passes the system on as a legacy to future generations. These valuable assets—sewers, streets, storm-water facilities, parks, waste management systems, public buildings, and the like - should be managed to get the highest possible return for the public.”

The framework for an asset management plan can be described in terms of seven questions.

- What do you have and where is it? (Inventory)
- What is it worth? (Costs/replacement rates)
- What is its condition and expected remaining service life? (Condition and capability analysis)
- What is the level of service expectation, and what needs to be done? (Capital and operating plans)
- When do you need to do it? (Multi-year capital and operating plans)
- How much will it cost and what is the acceptable level of risk? (Short- and long-term financial plan)
- How do you ensure long-term affordability? (Short- and long-term financial plan)

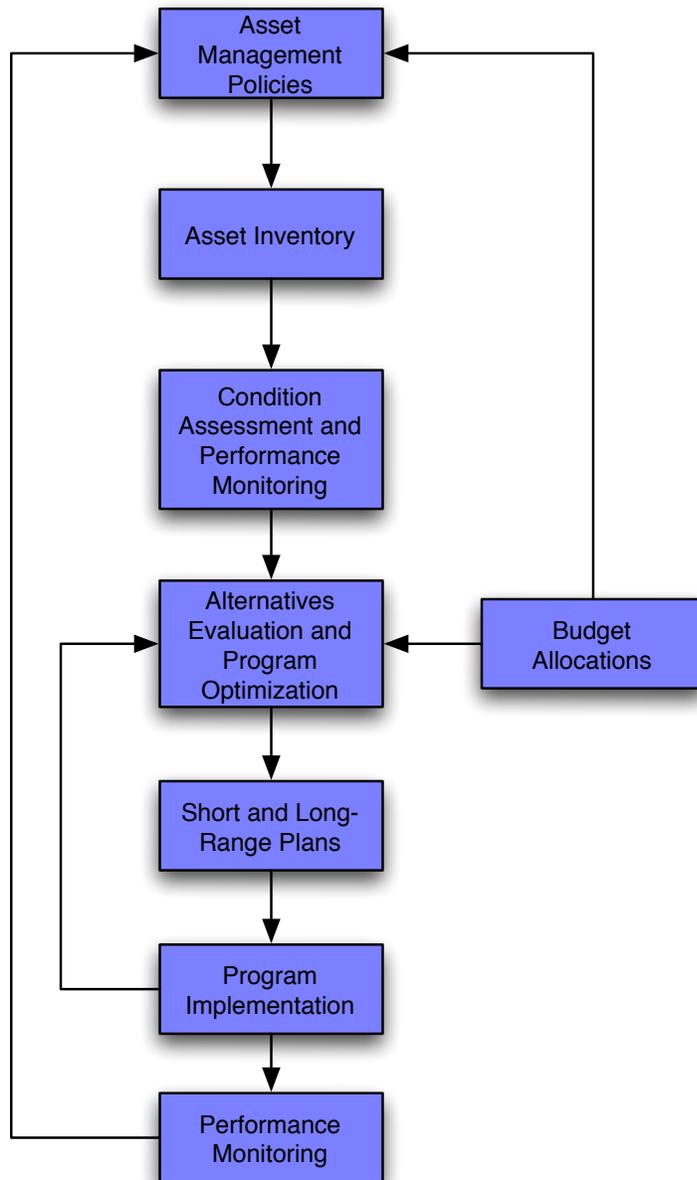
This chapter evaluates the asset management practices within the Water Supply and Distribution Program.

1. THE PUBLIC WORKS DEPARTMENT SHOULD DEVELOP AN ASSET MANAGEMENT POLICY AND PROCEDURE FOR THE CONSIDERATION OF THE OFFICE OF THE CITY MANAGER AND THE MAYOR AND THE CITY COUNCIL.

The Public Works Department should develop and adopt an asset management policy. The policy should be based on a systems approach, such as the approach suggested in the exhibit on the following page.

Asset Management Systems Approach

Key Questions



What are the asset policies and goals?

What is included in the inventory of assets?
 What is the value of the assets?
 What are their functions?
 What services do they provide?

What was the past condition of assets?
 What is the current condition and predicted future condition?

How can we preserve, maintain, or improve the assets to ensure the useful life and provide acceptable service to the public?

What financial resources are available?
 What is the projected level of future funding?

What financial options have been identified within and among asset classes?
 What are the costs and benefits of the options?

Which option or combination of options is "optimal"?

What are the consequences of not maintaining our assets?
 How can we communicate the impact of the condition and performance of our assets on the system and end user?

How do we monitor the impact of our decisions?
 How do we adjust our decision-making when indicated?

How can we best manage our assets in order to least inconvenience the customer when we repair or replace these facilities?

The asset management policy is the starting point for unifying asset management practices across the Department. Without this, alignment and consistent management control is not possible.

The Department lacks such a unifying, department-wide policy to coordinate the management of assets across the major categories (water supply and distribution, sanitary sewer, stormwater collection, streets, traffic signals, regulatory signs, sidewalks, etc.).

The Department should develop a formal, written policy and procedure regarding asset management that is related to clear goals, objectives, and measures of performance. The policy should define organizational roles and responsibilities in the implementation of the asset management policy and procedure. The specific aspects of this policy and procedure are presented below.

- Goals and objectives reflect a comprehensive, long-term view of asset management.
- Policy goals and objectives are comprehensive, and integrated with other City policy objectives, and supported by quantitative and measurable performance measures or criteria.
- Principles of good asset management are articulated in the policy and procedure and clearly recognized as the driving force for resource allocation and utilization.
- The goals and objectives support the preservation of existing infrastructure assets.
- Goals and objectives embody the perspective of life-cycle economic analyses of asset performance and cost, and encourage strategies with long-term benefits.
- The goals and objectives recognize the importance of reliable information on asset inventory and condition.
- The policy should encourage the development and updating of long-range asset management plans (e.g., water supply and distribution master plan) to provide clear and specific guidance for the capital program development process.

- The policy includes criteria for allocating resources, setting program priorities, and selecting projects consistent with stated policy goals and objectives and defined performance measures.
- The policy should require the regular, ongoing collection of information on the condition of assets.
- The policy should require the use of information on changes in asset condition over time to develop and improve forecasts of asset life and deterioration.

The Department's asset management policies and goals will define its most important priorities with regards to allocation of scarce financial resources.

There are a number of other cities that have developed such an asset management policy that can serve as a model. These include such cities as Portland, Oregon, and Seattle, Washington. The American Association of State Highway Officials has also developed extensive information regarding asset management.

Recommendation #6: The Public Works Department should develop an asset management policy and procedure for the consideration of the Office of the City Manager, Mayor and City Council.

2. THE PUBLIC WORKS DEPARTMENT SHOULD BE ASSIGNED ACCOUNTABILITY FOR THE MANAGEMENT OF THE ASSETS UNDER ITS STEWARDSHIP.

In the development of the asset management policy and procedure, the Department should clarify accountability for the management of each of the assets under its stewardship. This would include such assets as water supply and distribution, sanitary sewer collection, stormwater collection, traffic signals, streetlights, streets, sidewalks, etc. The Department should designate a specific manager for each asset. Each of these different classes of assets should have a separate asset manager.

For example, the City's Water Operations Manager should be the asset manager for water supply and production. The City's Electrical Communication Systems

Supervisor should be the asset manager for the City's streetlights and traffic signals. The City's Solid Waste Manager should be the asset manager for the City's sanitary and stormwater collection system. These asset managers should develop an asset strategy and plan for the assets assigned to their management.

The role of the Assistant Directors within the Public Works Department should be to manage the development of an asset management plan template, and to quality control the development of the asset management plan by each asset manager.

The clarification of the accountability should consider the following elements:

- Each asset manager would be responsible for the development of the Department's asset strategy for that specific asset;
- Each asset manager would be responsible for coordinating asset management of that specific asset across the Department;
- Each asset manager would be responsible for the preparation of an asset plan for that asset; and
- Each asset manager would be responsible for continuous improvement in the Department's approach for evaluating capital projects for that specific asset.

These asset managers, designated for each specific asset, are responsible for development of asset management plans; implementing asset management strategies and enabling tools; and evaluating asset performance and condition.

The Department should establish a departmental asset management committee to facilitate a coordinated departmental asset management approach. The committee should be comprised of each asset manager, the City Engineer, the Assistant Public Works Directors, and the Public Works Director. This asset management committee should develop a position description that clarifies the roles and responsibilities of an asset manager, and develop an asset management policy and procedure for

consideration of the Office of the City Manager, Mayor and City Council.

Recommendation #7: In the development of an asset management policy and procedure, the Public Works Department should clarify accountability for the management of each of the assets under its stewardship.

Recommendation #8: The Public Works Department should establish a departmental asset management committee to facilitate a coordinated departmental asset management approach.

Recommendation #9: The Public Works Department should designate the managers within the department that are accountable for managing each specific type of asset assigned to the stewardship of the Department. Each asset manager should be responsible for the development of an asset management strategy and plan for those assets assigned to their management.

3. THE CITY SHOULD ESTABLISH AN ASSET MANAGEMENT OFFICE IN THE OPERATIONAL SUPPORT DIVISION, PUBLIC WORKS DEPARTMENT

HDR, in its assessment of the Hansen computerized maintenance management system in 2014, noted a number of obstacles in the effective use of this system as a management information system. These obstacles are presented below.

- The Hansen computerized maintenance management system lacks an internal “champion” within the Department.
- A staff person has not been identified and trained to perform the role of business analyst to manage data or analyze Hansen data to the level the City is looking.
- The Department lacks an asset hierarchy (e.g., an asset hierarchy for a pump station could include pumps, motors, pump control valves, motor control center, etc.).
- Data standards and a change control process are lacking to ensure data integrity.
- Staff within the Department lack a common vision regarding how the Hansen computerized maintenance management system and the staff of the Department are supposed to work together.
- Standard business processes regarding how the Hansen computerized maintenance management system is to be used are lacking. Usage of the system between divisions varies. Use codes for service requests and work codes

are not consistent. There is not a consistent approach to create a work order. Work orders are completed after the work has been completed.

- The Hansen computerized maintenance management system does not generate useful reports.
- The asset registry in GIS is not synced with the Hansen computerized maintenance management system.
- The GIS technical architecture is not mature. GIS is in shape files and not in enterprise GIS. The enterprise SDE database is not versioned; edits take place in a default version.
- The Hansen computerized maintenance management system map services were being rendered using ARCMIS; this technology is no longer supported since the release of ArcGIS 10.1.
- Management and staff need a better understanding of asset management practices.
- Few staff in the Department have had training in the use of the Hansen computerized maintenance management system.

The City should establish an Asset Management Office within the Public Works Department. The intent of the Asset Management Office is to ensure consistency in asset management practices throughout the Public Works Department through policies, frameworks, templates and standard tools (e.g. level of services such as preventive maintenance, asset management plan templates, risk management tools, etc.).

The City has been attempting to fully deploy the Hansen computerized maintenance management system since 1997; it has largely failed.

Resolution of this problem, and the others noted by HDR in their assessment of the Hansen computerized maintenance management system, should be accomplished through the establishment of an Asset Management Office in the Public Works Department. In fact, HDR indicated that it “would be ideal to develop an asset management team that would manage both Hansen and the GIS bearing in mind The

Department of Public Works end goals. The ideal team would include skills that would allow for the administration of Hansen, GIS data entry and a general knowledge of business processes.”

The Asset Management Office is a fundamental requirement in the development and installation of asset management in the Public Works Department. Overall, the Asset Management Office should provide a support function to all divisions in the Department providing a clear asset management policy and asset management strategy, common standards (including tools and templates), ensuring consistency in delivery and reporting and ongoing support to departmental asset managers. Asset management concepts and practices should be operationalized and instilled in the Department’s culture through Asset Management Office staff: The asset managers in the divisions of the department should work with the Asset Management Office in the form of a network. In this way, the asset managers have a forum to influence overall asset management policy, strategy and future direction while the Asset Management Office ensures that there is real buy-in to asset management concepts and consistency in implementation and application of concepts and practices.

The Asset Management Office should be expected, initially, to:

- Manage the implementation of GIS in the Public Works Department working with the Information Technology Department;
- Manage the implementation of the Hansen computerized maintenance management system working with the Information Technology Department;
- Develop and populate levels of service at the asset level with supporting metrics that provides clear levels of service to guide decision-making (e.g., testing the registration accuracy of commercial meters in accordance with American Water Works Association guidelines);

- Working with the asset managers in the Public Works Department, develop asset management plans by type of asset to provide guidance for asset management activities, propose the maintenance, repair, and replacement strategies for each type of asset, and document the financial implications of the strategies;
- Establish a standardized methodology for condition assessments of assets including guidelines and frameworks;
- Establish asset management procedures and standard guidelines;
- Develop a comprehensive maintenance management system for the assets assigned to the stewardship of the Public Works Department; and
- Develop and implement asset management reporting strategies and policies.

There are a number of positions that should be allocated to the Asset Management Office. These include the positions noted below.

- The Civil Engineering GIS Specialist and any of the temporary GIS staff resources allocated to GIS within the Public Works Department.
- The GIS Integrator (this position is budgeted in the Information Technology Department, but the coordination between the Public Works Department and the Information Technology Department should be provided through the Asset Management Office).
- The Systems Integrator (this position is budgeted in the Information Technology Department, but the coordination between the Public Works Department and the Information Technology Department should be provided through the Asset Management Office). The overall coordination of the Systems Integrator position would be provided by the Deputy Director of Public Works Services - Operational Support, but the Systems Integrator should work within the Asset Management Office in the implementation of the Hansen computerized maintenance management system and its integration with other information systems such as Munis.
- The Planning and Research Analyst in Public Works Administration responsible for working with departmental managers, supervisors and the Systems Integrator to implement the Hansen computerized maintenance management system.
- In addition, in the longer-term, as the Hansen computerized maintenance management system is re-optimized, two Planner and Scheduler positions should be authorized for the Public Works Department within the Asset Management Office to plan and schedule the work of the various field operations

staff within the department, to update the asset registry, to facilitate condition assessments, etc.

There is simply a lot of work to be done by the Public Works Department in the development and implementation of effective asset management practices.

Recommendation #10: The City should establish an Asset Management Office within the Public Works Department. The Asset Management Office should be incorporated in the Operational Support Division of the department.

Recommendation #11: The Asset Management Office, Public Works Department should provide a support function to all divisions in the Department providing a clear asset management policy and asset management strategy, common standards (including tools and templates), ensuring consistency in delivery and reporting and ongoing support to departmental asset managers.

Recommendation #12: The Asset Management Office, Public Works Department should be expected, initially, to (1) Manage the implementation of GIS in the Public Works Department working with the Information Technology Department; (2) Manage the implementation of the Hansen computerized maintenance management system working with the Information Technology Department; (3) Develop and populate levels of service at the asset level with supporting metrics that provides clear levels of service to guide decision-making (e.g., testing the registration accuracy of commercial meters in accordance with American Water Works Association guidelines); (4) Working with the asset managers in the Public Works Department, develop asset management plans by type of asset to provide guidance for asset management activities, propose the maintenance, repair, and replacement strategies for each type of asset, and document the financial implications of the strategies; (5) Establish a standardized methodology for condition assessments of assets including guidelines and frameworks; (6) Establish asset management procedures and standard guidelines; (7) Develop a comprehensive maintenance management system for the assets assigned to the stewardship of the Public Works Department; (8) Develop and implement asset management reporting strategies and policies.

Recommendation #13: Four positions within the Public Works Department should be allocated to the Asset Management Office. These include: (1) the Civil Engineering GIS Specialist and any of the temporary GIS staff resources allocated to GIS within the Public Works Department; (2) the GIS Integrator (this position is budgeted in the Information Technology Department, but the coordination between the Public Works Department and the Information Technology Department should be provided through the Asset Management Office); (3) the Systems Integrator (the overall coordination of the Systems Integrator position would be provided by the Deputy Director of Public Works Services - Operational Support, but the position should work within the Asset

Management Office in the implementation of the Hansen computerized maintenance management system and its integration with other information systems such as Munis); (4) the Planning and Research Analyst in Public Works Administration responsible for working with departmental managers, supervisors and the Systems Integrator to implement the Hansen computerized maintenance management system.

Recommendation #14: In addition, in the longer-term, as the Hansen computerized maintenance management system is re-optimized, two Planner and Scheduler positions should be authorized for the Public Works Department within the Asset Management Office to plan and schedule the work of the various field operations staff within the department, to update the asset registry, to facilitate condition assessments, etc.

4. THE PUBLIC WORKS DEPARTMENT SHOULD DEVELOP COMPLETE ASSET INVENTORIES FOR THE ASSETS ASSIGNED TO THE DEPARTMENT FOR MAINTENANCE AND REPAIR.

While it will not be easy, the Public Works Department should develop a comprehensive and complete inventory of its assets using consistent standards. The department has already collected much asset information, but much remains to be collected. For example, asset information for fire hydrants are approximately 95% to 98% complete, backflow prevention devices are approximately 55% complete, pressure reducing valves are approximately 20% complete, water distribution mains are approximately 55% complete, and water meters are approximately 97% complete. Collection of asset inventory data for the Water Supply and Distribution Program has been ongoing for approximately six years.

To develop this comprehensive and complete inventory, the Department should take the steps summarized below.

- Identify the objectives of the Hansen computerized maintenance management system including how the asset inventory data will be utilized to maintain and repair these assets.
- Identify the types of assets that will be captured in an asset registry. Will this include water mains, air release valves, pressure reducing valves, water meters,

backflow prevention devices, water pumps, water storage tanks, etc.

- Identify the sources of asset inventory data.
- Develop standardized written methodology and standards for collection of the data – the attributes (e.g., for a water main, this could include the object identifier, the material of the pipe, the diameter, year installed, location description, pressure zone, etc.).
- Determine who will collect and enter the initial asset inventory data into the Hansen computerized maintenance management system.
- Assign responsibility for updating the asset inventory data in the Hansen computerized maintenance management system.
- Consider how the information will be collected and transferred to the Hansen computerized maintenance management system.
- Document specific asset inventory data to be collected as well as the quality control procedures.
- Establish a timeline for data collection on a department-wide basis.
- Before beginning the initial asset inventory, install and familiarize the data collection team with software and hardware tools, the required data and data collection and entry procedures.

Collecting asset inventory data doesn't necessarily require a large up-front investment of time and money. Instead of collecting all asset inventory data from the beginning, a phased approach allows the Public Works Department to start small and gradually grow their asset inventory. A phased approach allows an organization to adopt a system and procedures that are affordable and effectively meet immediate goals, but is also flexible enough to grow with the changing needs of both the organization.

Recommendation #15: The Asset Management Office, Public Works Department should coordinate and lead the collection of asset inventory data for each of the assets assigned to the Public Works Department for maintenance and repair.

5. THE PUBLIC WORKS DEPARTMENT SHOULD UPDATE THE INVENTORY OF THE ASSETS UNDER ITS STEWARDSHIP ON AN ONGOING BASIS.

An effective asset management system requires objective, high-quality data, presented to decision-makers and other stakeholders as understandable, useful information. The Department lacks accurate and complete asset inventory data for much of the assets assigned to its care.

Keeping asset information, such as construction dates and costs, features, location, maintenance and inspections, up-to-date, accessible and understandable is a significant challenge in asset management. This asset information is a virtual representation of the assets in the field. For the data to be useful, this “virtual inventory” must be kept up-to-date to match the state of the “physical inventory,” or the actual assets in the field. Monitoring the data on a regular basis is the key to keeping this virtual inventory current. The maintenance of this “virtual inventory” will require:

- The capturing and entry of asset information on any unrecorded assets discovered during regular maintenance by the staff of the Public Works Department;
- Entry of new records for assets as they are added to the system and the immediate incorporation of these assets into the maintenance schedule that is part of Hansen;
- Updating the results of asset condition inspections and assessments;
- Removal of assets from active duty when taken out-of-service, and archiving the information in the database; and
- The addition of other geographic information system layers not yet developed within the asset inventory.

In addition, the Public Works Department should periodically audit the data contained within the geographic information systems to assure the accuracy and consistency of

the data. These could consist of spot checks to confirm the virtual data against the physical data, and the checking of the asset libraries for duplicates or inconsistent data.

Two of the reasons for the failure of computerized maintenance management systems result from problems with asset inventory data as noted below.

- **Bad asset inventory data.** The quantity of data is not as important as the quality of data. Too much data can be a hindrance—and inaccurate or inconsistent data cannot be processed or utilized effectively. Start with the most crucial elements and determine the standards for recording this information. The system can be expanded in the future by collecting additional fields of data.
- **Inventory data is not maintained.** A system can't remain effective if it fails to receive periodic maintenance of inventory data. Relying on a single person to carry the ongoing weight of keeping the system up and running is also a mistake. It is necessary that all levels within the organization accept and adopt this new system and assist in updating the asset inventory data. Without this commitment, the system will ultimately fall short of the defined goals due to incomplete or inaccurate inventory data.

The Public Works Department should not stop inventory maintenance once the collection process is completed. This is an ongoing process that will require attention involving any physical changes to an asset.

Recommendation #16: The Asset Management Office, Public Works Department should coordinate the updating of the asset inventory data on an ongoing basis.

Recommendation #17: The responsibility for updating of the asset inventory information should be assigned to each asset manager within the Public Works Department in a written policy and procedure.

Recommendation #18: The Asset Management Office, Public Works Department should develop a written departmental policy and procedure regarding the updating of the asset inventory on an ongoing basis.

6. THE PUBLIC WORKS DEPARTMENT SHOULD CONDUCT CONDITION ASSESSMENTS OF ITS ASSETS ON A PERIODIC ONGOING BASIS.

Condition assessments must be made at regular intervals. The *American Water Works Association*, for example, in its Manual M42 Appendix C Inspecting and

Repairing Steel Water Tanks and Elevated Tanks for Water Storage recommends that “the maximum interval for periodic inspections of the tank interior should normally be 3 years. It is usually advisable to wash out the tank at the time of inspection.”

The condition assessments are necessary to determine maintenance and repair needs of critical assets; condition assessments are not necessary for residential water meters, but are necessary for critical water utility assets such as water storage tanks.

For most assets, there are good models available for condition assessment – the NASSCO sewer pipe condition rating system is one such example⁶. Additionally, paving condition assessment methodologies are quite mature. The pavement condition assessment methodology being utilized by Beverly Hills – MicroPAVER - should be utilized, on an ongoing basis, to evaluate the condition of the City’s streets on an ongoing basis. And water utility condition assessments are becoming more widespread to enable cities to concentrate scarce financial resources on the most critical assets. A condition assessment of water storage tanks, for example, would be based upon the *American Water Works Association* Manual M42 Appendix C Inspecting and Repairing Steel Water Tanks and Elevated Tanks for Water Storage and involves an inspection and assessment for the steel tanks of structural conditions (e.g., structural members, and connections, columns, shell thickness, floor conditions, nozzles, etc.); safety conditions; coating conditions (e.g., dry film thickness, adhesion, etc.); sanitary condition; security conditions; etc.

⁶ Manual of Sewer Condition Classification, National Association of Sewer Contractors

The Asset Management Office should be responsible for the coordination of these condition assessments for all of the assets assigned to the stewardship of the Public Works Department.

Recommendation #19: The Asset Management Office, Public Works Department should conduct periodic asset condition assessments of the assets under the stewardship of the Public Works Department.

7. THE PUBLIC WORKS DEPARTMENT SHOULD DEVELOP FIVE-YEAR ASSET PRESERVATION PLANS FOR THE ASSETS UNDER ITS STEWARDSHIP.

Long-range asset management planning, and priority programming of resources based upon these plans, should be central to the Department's resource allocation decisions. Asset preservation plans are being developed for streets, but are largely lacking or out-of-date for all of the other assets under the stewardship of the Department (e.g., water supply and distribution system, storm sewer collection system, sanitary sewer collection system, traffic signals, regulatory signs, etc.).

The Public Works Department should develop asset preservation plans for each of the assets under its stewardship. These long-term plans for the renewal and replacement of assets should be developed for the storm water collection system, sanitary sewer collection system, traffic signal system, regulatory signs, etc.

Recommendation #20: The Asset Management Office, Public Works Department should prepare a five-year plan for the renewal and replacement of the assets assigned to the Department's stewardship. These long-term plans for the renewal and replacement of assets should be developed for the water supply and distribution system, storm water collection system, sanitary sewer collection system, traffic signal system, regulatory signs, etc.

Recommendation #21: The five-term plans for the renewal and replacement of the assets assigned to the Department's stewardship should be prepared by the Asset Management Office with the advice and consultation of the asset managers.

8. THE ASSET MANAGEMENT OFFICE, PUBLIC WORKS DEPARTMENT SHOULD REPORT ANNUALLY ON THE PROGRESS OF THE DEPARTMENT IN IMPLEMENTATION OF EFFECTIVE ASSET MANAGEMENT PRACTICES.

This practice has been observed in the City of Portland, Oregon. The City publishes an annual report that summarizes the number of assets, replacement value, condition, and unmet funding needs. The report is designed to help the City's executive management and policy makers monitor the City's efforts to ensure infrastructure is in adequate condition and that operation, maintenance, rehabilitation, and development programs are as efficient and as effective as possible.

In addition, this annual report should report progress in implementation of the infrastructure master plans (e.g., water supply and distribution master plan).

Recommendation #22: The Asset Management Office, Public Works Department should report annually on the progress of the Department in implementation of effective asset management practices.

Recommendation #23: The annual asset management report should report progress in implementation of the infrastructure master plans (e.g., water supply and distribution master plan).

9. THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD DEVELOP AN INFRASTRUCTURE REPORT CARD WITHIN THE FIVE-YEAR CAPITAL IMPROVEMENT PROGRAM BUDGET THAT PROVIDES AN ASSESSMENT OF THE STATE OF THE CITY'S ASSETS.

The Government Finance Officers Association (GFOA) has adopted a number of best practice; the best practices identify specific policies and procedures contributing to improved government management.

One of the GFOA best practices recommends that local governments monitor and communicate progress toward stated goals and the overall condition of its capital assets. This monitoring and communicating should describe how actual facility condition and performance compares to the targeted standard for each type of asset.

This communication within the five-year capital improvement program should identify, in an overview, the status of the various types of assets of the City including water supply and production, wastewater, stormwater, streets, bridges, streetlights, traffic signals, facilities (buildings), parks, fleet, etc.

This could be based upon the same type of “dashboard” approach used by the American Society of Civil Engineers to report the status of infrastructure in the United States. The City of Oakland developed such a report card in 2012 for its infrastructure. The City of Rancho Palos Verde also developed an infrastructure report card in 2014. Either of these could be used as a model. The City of Beverly Hills should develop an infrastructure report card and include the report card in its five-year capital program budget; the report card should be updated annually.

The City of Chula Vista includes an infrastructure report card in its five-year capital improvement program budget. The summary of their assessment, as presented in their five-year capital improvement program budget, is portrayed below.

Green	Open Space Management System
Green	Wastewater Management System
Yellow	Parks Management System
Yellow	General Government Management System
Red	Building Management System
Red	Drainage Management System
Red	Fleet Management System
Red	Roadway Management System
Red	Urban Forestry Management System

The City of Chula Vista then discussed each asset type and its condition in the five-year capital improvement program budget. For example, for the Roadway Management System, the five-year capital improvement program budget discusses the pavement condition index by street category (arterial, collector, residential, alley); previous presentations to the City Council regarding the City's Roadway Management System; the annual funding requirements including the gap between the funding provided and the finding required; an overall discussion of the proposed projects for local streets, major streets, and traffic; a listing of the specific projects including the project cost for each project; and then the project description for each project.

Recommendation #24: The Public Works Department should develop an infrastructure report card and assessment that provides an evaluation of the state of the City's assets. The report card should be included in the 5-year capital improvement program budget.

6. ANALYSIS OF MAINTENANCE MANAGEMENT

This chapter presents an analysis of maintenance management practices for the Public Works Department. This analysis includes the following:

- The adequacy of maintenance management systems employed; and
- The deployment of the Hansen computerized maintenance management system to manage the maintenance of these assets.

In performing this study, the Matrix Consulting Group compared current maintenance management systems in the Department to best practices as defined by professional associations such as the American Water Works Association

Effective maintenance management systems use accurate information to enable efficient deployment of staff, materials, and capital resources to cost-effectively maintain assets.

1. EFFECTIVE IMPLEMENTATION OF THE HANSEN COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM IS ESSENTIAL TO THE EFFECTIVE MANAGEMENT OF THE MAINTENANCE AND REPAIR OF THE CITY'S ASSETS BY THE PUBLIC WORKS DEPARTMENT.

The Hansen computerized maintenance management system is an ArcGIS server extension web-based application that can be used to track service requests, work orders, inspections, and provide search and report capability.

The Hansen computerized maintenance management system can serve as the basis for maintenance management by the Department. Maintenance management is basically a management-by-objective approach to planning, organizing, directing and controlling work. This approach has three primary goals: increased productivity, effective management of levels of maintenance and repair service, and management of the City's assets.

The use of the Hansen computerized maintenance management system as a maintenance management suite would enable the Department to accomplish a best practice defined by the *American Public Works Association* in its *Management Practices Self-Assessment*. Management Practice 10.14 states “infrastructure maintenance activities are managed using dedicated work order systems to track requests, work orders, and costs of maintaining various infrastructure assets.”

The management of the maintenance and repair of assets to optimize their useful life and reduce maintenance costs is an ongoing challenge for the Department. However, the Department must shift its management for the entire range of its assets from being reactive to one of managing and delivering a proactive, managed system of preventive maintenance, renewal, and rehabilitation.

What is the benefit of a maintenance management system in accomplishing this change? These benefits are noted in the paragraphs below.

- **Are maintenance procedures working?** The management of the Public Works Department should be able to determine the total employee hours, grouped by work type or asset, and compare the amount of work performed to the amount of work scheduled. A key metric is amount of work accomplished that was scheduled versus unscheduled.
- **Are maintenance activities adequate?** The management of the Public Works Department should be able to look at the number of scheduled work orders grouped by work type or asset, and compare the amount of work that was scheduled to be performed based on pre-determined service levels to the amount of work actually performed. For example, the planned frequency with which sanitary sewers are cleaned can be compared to the actual frequency to determine whether assets are appropriately preventively maintained.
- **Where are my problems and where should limited resources focus?** The management of the Public Works Department should be able to look at the total cost for work type or class and sort the work requests by asset, and sort by location. This will identify by asset where all the time and associated costs are being accumulated. This is typically referred to as the “Top 10” list or “Bad Actors” report. By example, such information can be used to justify replacement

of a water main or overlay of a street as opposed to re-investing efforts in continued corrective maintenance.

- **Where is maintenance focusing their efforts?** The management of the Public Works 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 service level goals and targets. For example, are staff being used for repairs of assets (repairing a leak in a water main), while preventive maintenance of these assets is not being adequately accomplished (e.g., pressure reducing valves)?
- **What is the profile of our work backlog?** The management of the Public Works Department should be able to look at the backlog of all requested work, assuring that there is no less than 2 weeks and no more than 4 weeks of lower priority backlog. For example, what is the backlog of water distribution valves that need to be exercised?
- **How efficient is our maintenance staff?** The management of the Public Works Department should be able to review the labor hours per employee and per work order and compare these to developed benchmarks (e.g. number of water distribution valves exercised per crew day). These efficiency and effectiveness measures can be used to justify existing and future desired staffing levels.
- **How much money are we spending on maintenance services?** This includes parts, material and supply costs, contractor costs, and maintenance labor costs. The management of the Public Works Department should be able to review the unit costs for work accomplished by the Department and trends in those unit costs.

In summary, it is clear that a well-implemented and properly utilized Hansen computerized maintenance management system will generate several important benefits contributing to improved business processes and enhanced management decision-making.

The City has been working on the full and complete implementation of the Hansen computerized maintenance management system since 1997. It has largely failed so far.

As the Public Works Department moves forward with the implementation and re-optimization of the Hansen computerized maintenance management system, the installation should adhere to a number of important best management practices for maintenance management systems.

2. THE HANSEN COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM SHOULD BE UTILIZED AS A MAINTENANCE MANAGEMENT SYSTEM, NOT MERELY AS A WORK ORDER SYSTEM.

The Public Works Department should utilize the Hansen computerized maintenance management system as a maintenance management system to enable the identification of the services provided (e.g., water supply and distribution system preventive maintenance), the levels of service (e.g., 100% of the water distribution valves 16" and larger are exercised annually), the outputs of each of these services (e.g., the number of water distribution valves exercised per crew day), and the costs of those service in terms of the total cost and the cost per unit of output.

This maintenance management system needs to be installed within all maintenance and repair units of the Public Works Department.

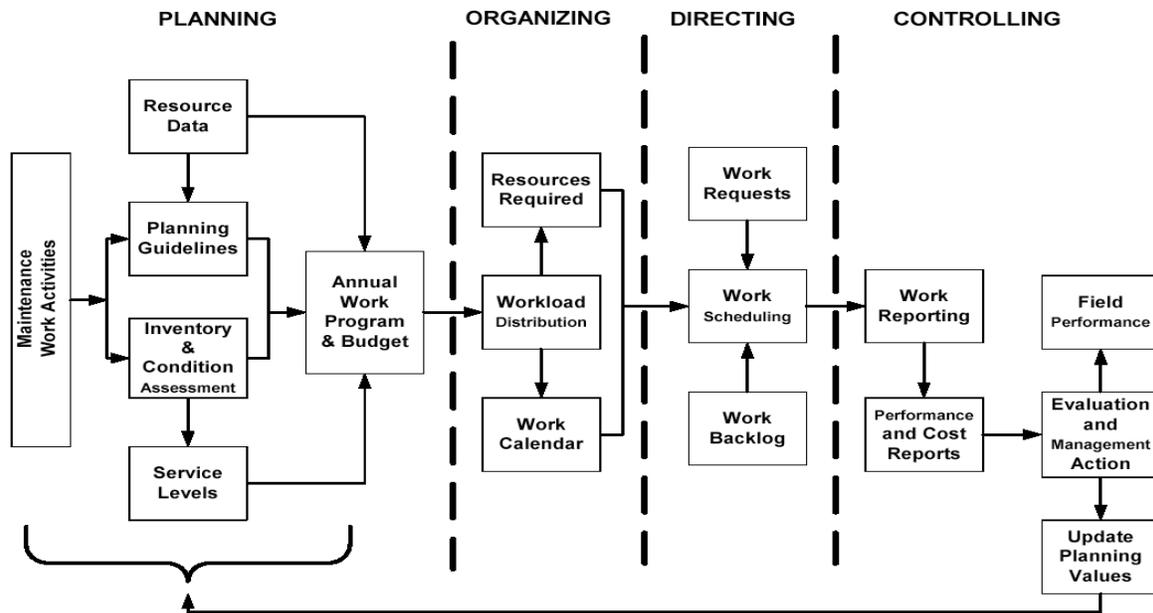
The components of a successful maintenance management system are presented below.

- **The Department should fully document the number and type of maintenance features (physical assets) is a major factor in determining the kinds and amounts of work needed.** An inventory of such maintenance features (physical assets) should be prepared for water supply and distribution, streets, urban forestry, sanitary sewer, storm sewer, traffic signals, etc.
- **The Department should develop activity guides for its maintenance management work activities.** Work activities should be defined for the significant activities representing the maintenance work to be performed. Definitions shall include and activity code, title, description, work unit and inventory unit. Such complete descriptions of activities are referred to as Activity

Guidelines and provide standards of performance for individuals and crews by setting forth the quality and quantity of results anticipated from each activity.

- **The Department should develop an annual work program and budget.** The activity-based work program and budget represents the product of the planning process and summarizes the kinds and amounts of work planned, the productivity of the work force, and the costs of the planned work. It also provides the basis for managing the annual work effort.
- **The Department should prepare an annual work calendar showing the monthly distribution of planned maintenance activities.** Labor, equipment and material resource requirements needed to accomplish the planned workload are also identified.
- **The Department should document the resources needed to accomplish the annual work program.** By organizing the labor, equipment and material resources, cities can ensure that planned maintenance can be accomplished with the available budget. Preparation of an annual work calendar and a monthly distribution of work can help document resource needs.
- **The Department should require that all first-line supervisors prepare formal weekly work schedules using the Hansen computerized maintenance management system.** The preparation of annual, seasonal and short-term schedules, as well as weekly plans, can provide guidance in achieving annual work program goals.
- **The Department should prepare monthly reports that compare the planned work output to actual.** Reports that will enable showing work accomplishment and cost data and a comparison of planned and actual work program accomplishment should be prepared.

The basic flow of this maintenance management system is presented in the chart on the next page.



The steps that need to be accomplished before the maintenance management system in the Hansen computerized maintenance management system can be effectively utilized are presented below.

- (1) **All of the Assets Maintained and Repaired by the Public Works Department Should Be Synced with the Asset Registry Module of the Hansen Computerized Maintenance Management System from the GIS Geodatabase.**

The Matrix Consulting Group recommends that inventory data regarding assets be collected and entered into a GIS geodatabase, and synced with the asset management module for the Hansen computerized maintenance management system on a phased-in basis.

Effective asset management requires a complete and accurate inventory of the assets. There are a number of reasons why this asset information is important in the cost effective life cycle management of these assets.

- **A comprehensive asset inventory will provide better information for the**

Mayor and City Council to make informed resource allocation decisions.

The Mayor and City Council, with a comprehensive asset inventory, can make better decisions regarding how tax dollars should be used, particularly as it concerns funding for renewal and rehabilitation of existing assets and the rates necessary to support those investments.

- **Governmental accounting standards are requiring enhanced and more consistent inventory information.** GASB 34 is a relatively new action that requires enhanced and more consistent information on infrastructure assets than has been required in the past. Local governments require better asset inventory data to meet these standards.
- **Hansen computerized maintenance management system relies on comprehensive asset inventory data.** Automating the once manual system of managing assets does more than increase the speed and efficiency of the process; it also ensures that the maintenance and repair of these assets are more effectively managed.

While it will not be easy, the Department should complete the inventory of its assets. It has already begun this effort.

The Department should begin with those types of assets that have already been inventoried and utilize those types of assets as the initial point of data entry into the Hansen computerized maintenance management system.

To develop this comprehensive inventory, the Department should take the steps noted below.

- Identify how the asset attribute data will be utilized in the Hansen computerized maintenance management system to maintain and repair these assets. This is to avoid collecting information that will not be utilized for maintenance management (e.g., assets that will be maintained as the sum of their parts). Understanding how the asset inventory data will be utilized is necessary to identify the data to collect. Data could initially be utilized to establish a preventive and corrective maintenance program. Not all data needs to be collected initially. Some may be essential to the initial phase of the Hansen computerized maintenance management system, while others, such as current replacement value, can be collected during later phases. The Department should start with the most important data and expand the data within the system over time.
- Identify sources of pertinent data. Once the required data for the Hansen computerized maintenance management system is defined, the Department

must determine how to obtain the data and how it will be entered into the new system. Necessary data is currently in paper records or must be documented and collected.

- Determine who will collect and enter the initial asset attribute data. The collection of attribute data is time intensive and costly. Data collection is typically collected in-house or through outsourcing. Evaluating the merits of these two options lies primarily with the costs associated with each. Using current personnel who are not devoted specifically to data collection will take them away from present duties. On the other hand, outsourcing requires that the cost be incorporated into the Department's budget. The Asset Management Office should be responsible for the coordination of the collection of asset inventory.
- Assign responsibility for updating the asset inventory data. The time and expense of collecting this asset inventory data will be wasted unless the inventory is kept current. The responsibility for updating this asset inventory needs to be clearly assigned. The responsibility for coordinating the updating of the asset inventory data should be assigned to the Asset Management Office.
- Consider how the information will be collected and synced with the Hansen computerized maintenance management system. Consider if forms should be created. A potential source of how the information should be collected is within the Hansen computerized maintenance management system itself.
- Document specific asset attribute data to be collected as well as the quality control procedures. In addition to identifying the data entry and collection staff, determine how this attribute data will be quality controlled. Data validation must ensure accuracy, and identify inconsistencies and potential problems, particularly during the early stages of the data collection.
- Establish a timeline for data collection and a project manager responsible for managing data collection. The Asset Management Office should develop a schedule for data collection and manage this process.
- Before beginning the initial asset inventory, install and familiarize the data collection team with software and hardware tools, the required data and data collection and entry procedures. The Asset Management Office should provide training to all team members. Since the initial inventory will involve manual data collection, the Asset Management Office should develop forms to gather the information in the field.
- Before beginning the initial asset inventory, the Asset Management Office should develop a plan for how to integrate the data within GIS. Spatial location is typically the one common aspect among all of the data at a Public Works Department. The spatial location presents the relationship between customers and assets by their spatial location and interconnection. When a Public Works

Department spatially enables its asset inventory data, it can use the analytical power of GIS to gain a better understanding of how the assets are performing and how they affect level of service and customers. GIS is consistently the gateway where large amounts of asset data enter a Public Works Department and where its basic characteristics (location, size, installation date, material, etc.) is maintained. So maps from GIS are the place to visualize, analyze and explore many pieces of asset related data and also enable the Department to propose ways to manage assets better (maintenance, rehabilitation or replacement) and understand the impact. Modern maintenance management systems always have a GIS integration component that includes a toolbar in desktop GIS to keep assets in sync between the GIS and the maintenance management system and also uses server-based GIS to give a spatial view of assets and work orders to Public Works Department staff that are scheduling and managing work orders. So the way maintenance management systems are integrated with GIS underscores the concept that maintenance management is about utilizing the best information from each system that stores data about assets.

- **Conduct a pilot program.** Completing a pilot program is an important part of making sure the asset inventory data collection meets needs and expectations. The assets selected for the pilot program should represent the assets as a whole and be limited in size. Once pilot program data is in the system, both the data and the process should be reviewed and quality controlled. Based upon the findings of the pilot project, the Asset Management Office should revisit the timeframe for collecting the asset inventory data.
- **Develop a timeline for the collection of inventory data.** The Asset Management Office should develop a schedule and be held accountable for meeting the schedule for the collection and input of asset attribute data for those assets assigned to the Public Works Department.

ESRI has developed tools with which to collect inventory data for some asset types including street signs, traffic signals, streetlight, bridges and sidewalks. These applications would enable the City to utilize a configuration of ArcGIS Online and Collector for ArcGIS application that can be used by Asset Management Office staff to collect asset attribute data.

Recommendation #25: The Asset Management Office should collect and enter asset data for those assets entrusted to its care into the GIS geodatabase and sync the geodatabase with the asset registry of the Hansen computerized maintenance management system asset management module on a phased-in basis.

Recommendation #26: The Asset Management Office should begin with those types of assets that have already been inventoried and utilize those types of assets for the initial syncing with the asset registry of the Hansen computerized maintenance management system.

Recommendation #27: Before beginning the initial asset inventory, the Department should develop a plan for how to sync the data within GIS initially and on an ongoing basis.

Recommendation #28: The Asset Management Office should utilize the inventory data collection tools developed by ESRI for water supply and distribution, street signs, traffic signals, streetlight, bridges and sidewalks, etc.

(2) The Hansen Computerized Maintenance Management System Customer Relationship Management Module Should Go Live.

The Hansen computerized maintenance management system Customer Relationship Management module is designed for the citizen and the business providing an efficient way to shift traditional counter services that normally arrive through phone, fax, or email to using the Internet. This service provides an easy and convenient online access to contact the Public Works Department concerning service requests. Other cities – such as the City of Monterey - are already using the Hansen computerized maintenance management system in this capacity.

Citizens and businesses can choose a self-service option to place a request using the same workflow available to the Public Works Department. A service request can be organized by pull down menus or keyword searches. A location, along with a description, can be added to provide the information that is fitting to the service request.

The Hansen computerized maintenance management system Customer Relationship Management module uses web services to interface directly to a service request. Once the citizen or business has submitted the service request online, it is automatically saved to the Hansen computerized maintenance management system

Customer Relationship Management module database where the Public Works Department can manage the request as they would any other request. Citizens and businesses can view the status of their request at any time by returning to the Hansen computerized maintenance management system Customer Relationship Management module and entering their own service request ID. This enables citizens and businesses to quickly find information without having to call the Public Works Department, reducing the burden on staff.

The existence of the Hansen computerized maintenance management system Customer Relationship Management module should be noticed in the City's newsletter when the feature is available.

Recommendation #29: The Public Works Department should work with the Information Technology Department to install the Hansen computerized maintenance management system Customer Relationship Management module.

Recommendation #30: The existence of the Hansen computerized maintenance management system Customer Relationship Management module should be noticed in the City's newsletter when the feature is available.

(3) All of the Labor Hours that Crews Work Completing Work Orders Should Be Recorded to the Work Order / Maintenance Management Module in the Hansen Computerized Maintenance Management System.

It is typically problematic to ensure that labor hours are being consistently recorded to work orders by the staff of the Department. In other words, some staff will have difficulty grasping the importance of recording all of their work hours – their entire shift – in work orders in the Hansen computerized maintenance management system Work Order / Maintenance Management module.

In fact, the staff assigned to water production – the reverse osmosis plant – do not complete work orders at all within the Hansen computerized maintenance

management system. As a consequence, it was not possible to quantitatively identify how these staff were utilized.

In order to evaluate the efficient use of staff assigned to the maintenance and repair of the water distribution system, the Matrix Consulting Group sampled work orders in the Hansen computerized maintenance management system. By analyzing the work activities performed and how many labor hours were allocated to the different work activities, the analysis can reveal work priorities and the efficiency of staff.

Six sample weeks were selected throughout calendar year 2015, to account for seasonal differences in activities. A table summarizing the data is presented below.

Start Date	End Date	Number of Work Orders
January 25	January 31	28
April 19	April 25	8
April 26	May 2	11
July 19	July 25	38
July 26	August 1	36
October 18	October 24	27
TOTAL		148

As the table indicates, the number of work orders per week ranges from a low of 8 work orders during the week of April 19 to a high of 38 work orders during the week of July 19.

The Matrix Consulting Group next assessed what proportion of labor hours were captured in these work orders. There are a total of thirteen (13) Senior Water Worker and Water Worker positions allocated to the maintenance and repair of the water distribution system; with all positions filled and all staff available for work and not on leave, here are 520 possible hours in any week. The Matrix Consulting Group would expect 72% of these labor hours, on an annual average, to be charged to work orders

allowing for leave, absences, training, get ready and cleanup, etc. This would suggest that a total of 374 labor hours, on average, should be charged to work orders each week. The results of the analysis of time accounted for by week is shown in the following table.

	January 25 to 31	April 19 to 25	April 26 to May 2	July 19 to 25	Jul. 26 to August 1	October 18 to 24
Actual Work Order Hours	82.0	294.0	33.0	48.5	162.5	46.3
Expected Hours	374	374	374	374	374	374
% Accounted	21.9%	78.6%	8.8%	13.0%	43.4%	12.4%
% Unaccounted	78.1%	21.4%	91.2%	87.0%	56.6%	87.6%

As indicated in the table, the amount of labor hours captured on work orders ranged from a low of 33 labor hours to a high of 294 labor hours. The % of labor hours unaccounted for ranged from a low of 21% for the week of April 19 to a high of 91% for the week of April 26. Overall, the staff of the to the maintenance and repair of the water distribution system appear to be capturing 30% of their labor hours in work orders.

The Field Services Supervisor and the Water System Production / Operations Supervisor should not assign any work to their staff without the development of work orders. This is a basic element of assigning, planning and scheduling work.

The Water Supply and Distribution Program should develop and adopt policies and procedures that require the creation and completion of work orders for any work assigned to the staff of the program. A possible policy and procedure is presented in the exhibit following this page.

Planning and Scheduling a Work Order Business Process

Activity	Description	Perform / Accountable	Consult	Comments
1. Query Hansen CMMS for new WO requests	Determine work orders that need to be assigned to the crews by Hansen CMMS regarding the status of WOs with the following: * WAPPR – <i>waiting for approval</i> * WPLAN – <i>waiting for planning</i> * WSCH – <i>waiting for schedule</i> * HELD – <i>for WOs from Customer Services</i>	Field Services Supervisor, Water System Production / Operations Supervisor	Water Operations Manager	See Create Work Order Procedure
2. Modify Work Order	Review work orders for accuracy; typically for either the Location or Asset/Equipment . Correction or modification to an existing work order.	Field Services Supervisor, Water System Production / Operations Supervisor	Water Operations Manager	See Create Work Order Procedure
3. Plan and Schedule Work	Review work orders and schedule the work order according to priority, target dates and availability of resources.	Field Services Supervisor, Water System Production / Operations Supervisor	Water Operations Manager	See Create Work Order Procedure
4. Approve & Assign Work to Crews	WO is approved and assigned to a field crew	Field Services Supervisor, Water System Production / Operations Supervisor	Water Operations Manager	See Create Work Order Procedure

Exhibit 6 (2)

Activity	Description	Perform / Accountable	Consult	Comments
Query & review all WO in WKDONE status	Review WOs for accuracy and ensure job has been fully completed.	Field Services Supervisor, Water System Production / Operations Supervisor	Water Operations Manager	See Create Work Order Procedure
Create follow up WO	When additional work needs to be performed on an assigned asset, a follow up work order is created	Field Services Supervisor, Water System Production / Operations Supervisor	Water Operations Manager	See Create Work Order Procedure

In addition, it appears the accuracy of the data contained within work orders completed by the staff of the Water Supply and Distribution Program is problematic.

In 5 work orders of the 148 work orders analyzed by the Matrix Consulting Group⁷, the hard copy work order contained a different number of labor hours than the Hansen computerized maintenance management system, ranging from 1 hour to 3 hours. In another instance, a hard copy work order documented that the work was performed in January, but the Hansen computerized maintenance management system indicated that the work started and ended in late February.⁸

Furthermore, the analysis of the data within the Hansen computerized maintenance management system found that approximately one-third of work orders reviewed had an “initiated” date, but no started or closed date. Given that these work orders were pulled exclusively from 2015, there should be relatively few still incomplete work orders, particularly in the basic maintenance categories like stuck meters or meter box replacement.

A significant number of work orders appeared to have been completed, but did not contain any labor hours for the completed work. These work orders indicated a task or work activity and an address, but no labor hours dedicated to the task or work activity. Many of these work orders had no start or end date. While it is possible these tasks from 2015 were never completed, it seems more likely that they were completed but never closed in the Hansen computerized maintenance management system.

A particularly prevalent data issue was what appeared to be inaccurate labor hours allocated to work orders. The Matrix Consulting Group noted that in some weeks -

⁷ Work Orders: 29577, 29578, 33064, 33364, 33183

⁸ Work Order 30014.

particularly in July - there were multiple consecutive entries that contained exactly one labor hour for each work order. These entries were initiated, started, and closed within a five-minute period. The appearance of numerous consecutive one-hour entries is an indicator of inaccurate labor hour entry or indications that the staff did not indicate any labor hours on the hard copy work order. There were 52 work orders, out of the 148 work orders in the Hansen computerized maintenance management system analyzed by the Matrix Consulting Group, in which one labor hour was recorded for each work order. The Matrix Consulting Group could not cross check these entries within the Hansen computerized maintenance management system against hard copy work orders as these hard copy work orders were not available.

Examples of inaccurate work orders are presented in the table below. The first work order contains labor hours that appear to reflect “actuals”, although the work order appears to have been closed long after the work was actually completed; the work order started on July 22, and closed on December 30. The other four work orders in the table it appear to contain inaccurate labor hours: each is assigned just one hour of work, and the consecutive work orders were initiated, started, and closed in a matter of minutes.

Work Order	Activity Description	Hours	Date Work Order Initiated		Date Work Order Started		Date Work Order Closed	
			Date	Time	Date	Time	Date	Time
33064	Curb Stop Valve Replacement/Repair	17	22-Jul	16:06	22-Jul	16:07	30-Dec	8:49
33048	Meter Reads/Final Reads	1	22-Jul	14:18	22-Jul	14:18	22-Jul	14:18
33049	Turn On/Off Water Service Due To Non Payment	1	22-Jul	14:19	22-Jul	14:19	22-Jul	14:19
33051	Turn On/Off Water Service Due To Non Payment	1	22-Jul	14:21	22-Jul	14:21	22-Jul	14:21
33052	Meter Reads/Final Reads	1	22-Jul	14:25	22-Jul	14:25	22-Jul	14:25

In these instances, it appears that the hard copy work orders did not include table hours, and that the employee entering the data from the hard copy work order into the Hansen computerized maintenance management system was guessing at the number of labor hours.

The table below shows the problems noted by the Matrix Consulting Group regarding data in work orders and their rate of prevalence in the total sample of work orders reviewed.

Problem Noted	Number of Work Orders	Percentage of Total Sample (n=148)
Suspected work orders in which the labor hours were a "guess"	52	35.1%
No "close" date	49	33.1%
No "start" date	42	28.4%
No hours entered	39	26.4%
Hansen hours do not match paper work order	5	3.4%

As the table indicates, a large proportion of the work orders sampled by the Matrix Consulting Group had some error. The problems noted in the table above overlap (e.g., an instance in which a work order with no start date also did not have any hours entered) so the percentages sum to over 100%. Altogether, it appears that 65% of the 148 work orders sampled by the Matrix Consulting Group contained some sort of error.

The analysis by the Matrix Consulting Group indicated that each of the six sample weeks appeared to have a different type of problem with entry of data within the Hansen computerized maintenance management system: January had a large number of work orders with no hours assigned; April had very few work orders entered in to the Hansen computerized maintenance management system; July had the greatest number of "suspect labor hour" entries (e.g., all the labor hours were one hour); and October had a mix of no hours entered and "suspect labor hour" entries".

This would indicate that there is a lack of training regarding the use of Hansen computerized maintenance management system, and a lack of accountability for completion of work orders by the crews in the Water Supply and Distribution Program. If each staff assigned to enter work order data into the Hansen computerized maintenance management system does so differently, this type of difference from week-to-week is not unexpected. In fact, Interviews with staff of the Water Supply and Distribution Program conform this finding: work order entry is assigned to whoever is tasked with light duty at the time, and each performs the data entry with little or no training.

Without accurate data, reliable conclusions cannot be drawn regarding how field staff allocate labor hours. Knowing how staff allocate labor hours is essential to accurate and efficient management.

In order to resolve this issue, the staff assigned to the Water Supply and Distribution Program should be trained in completing all aspects of the work order, and, as noted later in this chapter, handheld devices acquired (e.g., mobile data terminals in crew vehicles) to ease data entry by the staff.

These work orders, upon completion by the crews of the Water Supply and Distribution Program, should be reviewed for validity of the data and the completeness by the Field Services Supervisor or the Water System Production / Operations Supervisor, and if problems are noted, referred back to staff for correction.

The suggested procedure for completing this review by these two supervisors is presented in the exhibit following this page.

Completing Work Order Business Process

Activity	Description	Perform / Accountable	Consult	Comments
1. Query for work orders that have been completed	This activity is to ensure that all data is accurate before proceeding to the next steps. A Query will be conducted in Hansen for all work orders completed for each Section by each first line supervisor	Field Services Supervisor	Water Operations Manager	Performing Queries and making changes to a work order is found in the Work Order Procedure
2. Review work order	Work Orders are then reviewed to ensure accuracy and completeness of data (<i>all fields in the Hansen WO screen must be completed</i>). If information is incomplete or inaccurate, the field crew will be requested to make necessary corrections and/or updates.	Field Services Supervisor	Water Operations Manager	Performing Queries and making changes to a work order is found in the Work Order Procedure
3. Complete work order	When the work is completed, the work order status is change to (complete).	Field Services Supervisor	Water Operations Manager	See Work Order Procedure
4. Make Corrections	All information needed must be available to make necessary corrections to the WO.	Field Services Supervisor	Water Operations Manager	See Work Order Procedure
5. Return WO to field crew	Crew is notified if work order is incomplete or inaccurate for necessary corrections.	Field Services Supervisor	Water Operations Manager	See Work Order Procedure

Recommendation #31: The Field Services Supervisor and the Water System Production / Operations Supervisor should not assign work to their staff without the creation of work orders, and the planning and scheduling of work orders.

Recommendation #32: The Asset Management Office should develop and adopt policies and procedures that require the creation and completion of work orders for any work assigned to the staff of the Program.

Recommendation #33: The Field Services Supervisor and the Water System Production / Operations Supervisor in the Public Works Department should review and verify the completeness and the validity of the data in each work order prior to closure of each work order in the Hansen Work Order / Maintenance Management module. This should be accomplished the same day as the work associated with the work order is completed.

Recommendation #34: The Field Operations and Infrastructure staff of the Public Works Department should periodically be provided with training in the use of the Hansen Work Order / Maintenance Management module.

Recommendation #35: The Asset Management Office should develop a formal written policy and procedure regarding the review of work orders for validity of the data and the completeness by the first line supervisor.

(4) All of the Materials Used by Crews in their Maintenance and Repair Work Should Be Entered to Work Orders in the Hansen Work Order / Maintenance Management module.

The maintenance staff of the Public Works Department should be held responsible for performing the work detailed through the work order, charging labor hours and the types and amounts of material in the work order. This should include entering the parts and inventory consumed as part of the work order into the Hansen Work Order / Maintenance Management as noted below.

- Access the part number in the Hansen Work Order / Maintenance Management module using draw down menus;
- Enter the date the part or inventory was issued;
- Enter the name of the crew leader the part or inventory was issued to using a draw down menu; and
- Enter the quantity of parts or inventory issued.

The unit price of the part would already be included in Hansen. The total cost of the parts or inventory issued would be calculated by Hansen and entered to the work order. However, if the crew is picking up a part not issued by the Department's stockroom(s) (e.g., from Home Depot or Lowe's), then the crew should write the work order number on the receipt and enter that data into the work order in Hansen.

Recommendation #36: All of the materials used by the crews in their maintenance and repair work should be entered into work orders in the Hansen Work Order / Maintenance Management module.

(5) The Asset Management Office Should Develop Formal Written Policies and Procedures for the Use of Hansen and Train Staff Regarding Hansen.

To ensure that the staff of the Public Works Department understand their roles and responsibilities in working with Hansen, the Asset Management Group should complete written procedures regarding the day-to-day use of Hansen by the staff of the Department. These procedures should include the following:

- Receiving a service request, and assigning the request for work to a specific section or division (e.g., Water Supply and Distribution, Streets, Sewers, etc.);
- Creating a corrective maintenance or service request work order;
- Creating a preventive maintenance work order;
- Scheduling and assigning a work order to a crew;
- Completing a work order (by the crew leader);
- Reviewing and quality controlling a work order (by a first-line supervisor);
- Closing a work order (by a first-line supervisor); and
- Recording materials used to a work order.

The Asset Management Office should provide the staff of the Public Works Department with copies of the policies and procedures, provide training in their use and

application, and provide the opportunity to answer questions. The Public Works Director, Assistant Directors, and the middle managers of the Department should then hold the staff accountable for compliance.

Recommendation #37: The Asset Management Office should complete written policies and procedures regarding the day-to-day use of Hansen by the staff of the Department.

Recommendation #38: The Asset Management Office should provide the staff of the Public Works Department with copies of the policies and procedures, provide training in their use and application, and provide the opportunity to answer questions. The Public Works Director, Assistant Directors, and the middle managers of the Department should then hold the staff accountable for compliance.

(6) The Hansen Inventory Manager Module Should “Go Live” Including the Stockroom Inventory.

The Public Works Department should “go live” with the Hansen Inventory Manager module. The Hansen Inventory Manager module is integrated with the work order module so that associated time and costs for personnel, crews, contractors, vendors, equipment, and other items pulled from inventory can be tracked. This module:

- Enables the addition and tracking of equipment and materials to work orders; and
- Enables real time inventory tracking with alerts for low inventory.

Without the complete deployment of the Hansen Inventory Manager module, it will not be possible for the Public Works Department to fully cost out its work activities – labor, equipment, and parts.

Recommendation #39: The Public Works Department should “go live” with the Hansen Inventory Manager module, with the complete deployment of the module to record equipment and materials.

(7) Activity Guides Should Be Developed for the Work Activities Performed by the Public Works Department.

Different employees can interpret and define work activities differently. Differences in interpretation can result in unreliable data within the maintenance management system.

It is essential that work activities be defined consistently. This requires the development of complete descriptions of maintenance activities... the what, where, when, why, how and how much of maintenance activities. These should be defined in activity guides.

The Public Works Department should define the work activities performed by their units and to develop activity guides.

The supervisors need only assure that all of the primary work activities 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.

The work activities need to be carefully defined to assure that the same terminology is used for the work performed by all staff. Each of these work activities should define the unit of measure. An example of a work activity and unit of measure are provided below.

Work Activity	Activity Description	Unit of Measure
Exercise water distribution valves	Exercising of water distribution gate valves by fully closing and reopening the gate valve to be sure the gate valve is capable of being operated for emergency use.	Gate Valve

A complete list of work activities should encompass about 90% of the workload. This typically involves the top 20 to 30 activities in each unit (i.e., Water Supply and

Distribution, Streets, Sewer etc.). The remaining 10% of the work includes a large number of miscellaneous activities, which may be defined as a group under "other" or "miscellaneous" category.

Recommendation #40: The Asset Management Office should work with the first-line supervisors of the Department to define the work activities including the activity, the activity description, and the unit of measure.

(8) The Asset Management Office Should Define the Levels of Service to be Provided in Maintaining Assets.

Levels of service should vary depending on the type of facility, intensity of use, and local standards. For the purposes of maintenance management, service levels must be specific. Examples of specific service-level standards are:

- Water distribution gate valves 12" or larger shall be exercised once a year, and gate valves smaller than 12" shall be exercised once every three years; and
- Fire hydrants shall be inspected and preventively maintained annually.

Some judgment, of course, may be needed in applying these standards, but they do provide specific and useful guidelines – in terms of what maintenance should be performed and what maintenance should be deferred. These standards are useful in determining the amount of work needed to attain desired levels of service.

The Asset Management Office should work with the first-line supervisors of the Department to define the service level standards for the work activities performed by the Department.

Recommendation #41: The Asset Management Office should work with the first-line supervisors of the Department to define the service level standards for the work activities performed by the Department.

(9) The Department Should Develop Activity Guides for Each Work Activity.

The next step in deploying a maintenance management system is to define the work to be done. The work must be identified in unmistakable terms that are measurable and that can be related to resource requirements on a consistent basis. The work activities are identified by name (such as emergency service requests).

These activity guides are used to define the best way to accomplish each activity. The optimum crew and equipment complement is specified, along with the major materials needed and the preferred procedure for doing the work. Also, the expected amount of work to be accomplished each day is specified, based on using the standard over a period of time under average conditions.

Each standard should include at least six elements as noted below.

- A brief description of the specific work involved – the work that is to be performed by the crew;
- The frequency with which the work should be performed (or the level of service) and the criteria for scheduling the work;
- 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 exercising water distribution valves is presented in the exhibit following this page.

The Asset Management Office should work with the first-line supervisors of the Department to develop activity guides for the work activities performed by the Department.

Sample Performance Standard

ACTIVITY NO:	ACTIVITY NAME:	DATE:
601	Exercising Water Distribution Gate	Jan 16

ACTIVITY DESCRIPTION:

Exercising of water distribution gate valves by fully closing and reopening the gate valve to be sure the gate valve is capable of being operated for emergency use.

PERFORMANCE CRITERIA:

Gate valves larger than 16" shall be exercised annually. Gate valves smaller than 16" shall be exercised once every three years.

TYPICAL CREW SIZE:

☞ 2 Person

WORK METHOD:

- ◆ Place safety signs and devices at the work site as necessary.
- ◆ Exercise the gate valve to fully close and reopen the valve.
- ◆ Leave the valve in the open position unless otherwise noted in the work order.
- ◆ Badly corroded valves should be operated several times.
- ◆ Clean out the valve box and paint the valve cover.
- ◆ Valve packing, stems, nuts, and gearing in bad condition should be reported to the Field Services Supervisor.

EQUIPMENT:

½ Ton Pickup Truck

MATERIAL:

Paint

PRODUCTION STANDARDS:

- ◆ UNIT OF MEASUREMENT: Valves Exercised
- ◆ AVERAGE DAILY PRODUCTION: 25 to 30
- ◆ MAN HOURS PER WORK UNIT:

Recommendation #42: The Asset Management Office should work with the first-line supervisors of the Department to develop activity guides for the work activities performed by the Department.

(10) The Asset Management Office Should Develop an Annual Work Program and Calendar for each Program.

The development of an annual work program would enable the Public Works Department to accomplish a best practice defined by the *American Public Works Association* in its *Management Practices Self-Assessment*. Management Practice 4.5 states “a system is established to determine the cost of providing individual services or service levels. Costs are generally categorized into capital, operations, and maintenance. Identifying a unit cost of service is essential to guide the allocation of resources and project workloads. Cost of service should be based on full-cost allocation including general overhead and administrative expenses.”

The development of an annual work program answers 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 those levels of service and at what cost?

The annual work program is prepared annually and serves as a planning document that established 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 levels 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 first-line supervisors.

**Management Requirements for the
Development of an Annual Work Plan**

Component in the Development of the Annual Plan	Requirement	Responsibility
<p>Identification of Information Sources and Needs</p>	<ul style="list-style-type: none"> • The Treatment and Field Services sections should analyze the sources of information available in their determination of feasible service level targets. These include the daily activity sheets generated by each crew. • Management staff should review and operationalize the Hansen Work Order system to ensure the consistent and comprehensive capture of both operational and project activity data. 	<ul style="list-style-type: none"> • Although this step should be initiated by the Water Operations Manager, it should involve, initially, the Field Services Supervisor and the Water Systems/Production Supervisor as well. The Assistant Department Director should be consulted in the process to ensure that proposed service levels are appropriate. • The Field Services Supervisor and the Water Systems/Production Supervisor should be involved in the process, as implementation and training in the use of the work order and project modules will be required. • It is likely that supplemental training from the vendor will be necessary to identify the best features and capabilities that meet the Utility's needs.
<p>Analysis of Historical Trends in Services Provided</p>	<ul style="list-style-type: none"> • The Treatment and Field Services sections should determine the levels of service that 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 service calls, valve preventive maintenance, etc. • This analysis will require a thorough review of the Utility's monthly activity reports in order to extract person-hour data by activity. 	<ul style="list-style-type: none"> • Although the analysis may be delegated to first-line supervisors, the effort should be initiated by division managers.

Component in the Development of the Annual Plan	Requirement	Responsibility
Service Level Needs Analysis	<ul style="list-style-type: none"> • After the development and presentation of the raw data regarding historical trends, these trend data should be matched against available resources to determine the feasible targeted service levels for each activity. Input factors such as optimal crew sizes, required work, probable numbers of resident requests based on population growth, equipment availability, and others will be utilized in this determination. • The result of this step will be a definition of feasible targeted service levels for each activity type, as well as a priority listing of activities that are most critical for the sections 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. 	<ul style="list-style-type: none"> • Water Operations Manager • First-line supervisors • The Assistant Department 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	<ul style="list-style-type: none"> • This step will be the natural result of the preceding step. The sections may, after analyzing historical trends and available staff and equipment resources, find that there is a mismatch between feasible and desired service levels. Refinements will be made, and will lead to the next step, which is the development of budgetary needs commensurate with the targeted service levels. 	<ul style="list-style-type: none"> • Water Operations Manager • First-line supervisors

Component in the Development of the Annual Plan	Requirement	Responsibility
Development of Program Budgets	<ul style="list-style-type: none"> • This step represents the relatively mechanical process of developing program budgets for each of the activities provided by the two sections. 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 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 Water Utility as a whole, based on the previous years' expenditures. 	<ul style="list-style-type: none"> • The Water Operations Manager and first-line supervisors will be responsible for the determination of budgetary requirements for each of their assigned areas of responsibility. • The Assistant Department Director should be responsible for guiding the process, and for assembling and presenting the final budget package to the Department Director. The Assistant Department Director will also be responsible for making decisions regarding budgetary reductions, additions or reallocations between sections prior to the development of the final package.
Activity Monitoring and Reporting	<ul style="list-style-type: none"> • Once targeted service levels have been defined, with budgets established for each activity, the Water Operations Manager 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 separate sections' abilities to accomplish the overall performance targets. • Corrective actions must be defined. These may take the form of budget transfers, deferral of planned work, or outsourcing of planned activities. 	<ul style="list-style-type: none"> • The Water Operations Manager should be responsible for monitoring of budgets and work accomplishment according to plan, for each of their assigned areas. • Monthly meetings with the Assistant Department Director should be planned. These meetings should focus on variances from plans, and the corrective actions necessary.
Management of Resources	<ul style="list-style-type: none"> • The reporting of time, activities and expenditures should not be a strictly reactive function. Refinements must be made to the allocation of resources as it becomes clear that problems have surfaced. Examples of problems that may legitimately cause deviations from original plans may include weather related problems, unforeseen employee absences or turnover, or cost/labor issues with contractors. 	<ul style="list-style-type: none"> • The Water Operations Manager and section supervisors should monitor these issues daily and make refinements.

Their roles should evolve from reactive field supervision and allocation of tasks to crews, to proactive management of personnel, equipment and financial resources through analysis of reports, communication with their crews and the Department managers, as well as cost and workload analysis, in order to ensure conformance with the annual work plans.

To develop an annual work program, the Department should first develop unit costs labor, equipment, and materials so that the cost of performing the work can be determined. The unit costs can then be applied to the standard list of resources for each performance standard developed to determine the average daily cost for performing each activity. With the inventory, standards, and unit costs in hand, the annual work program may be determined. By applying the standards to the inventory values, the annual workloads by activity are determined.

Applying the standards to the workload provides the amount of labor, equipment, and materials required to accomplish the work.

After development of the annual work program, the next step is to develop an annual calendar. To accomplish the work program efficiently, the workload must be evenly distributed throughout each month of the year. Seasonal influences on the work must be taken into account first such as snow control. Then, the remainder of the workload must be distributed to achieve as level a workload as possible.

With the workload spread out over the year on a monthly basis, an annual work calendar can be developed to guide the development of short-term schedules. Specific requirements for labor, equipment, and materials on a monthly basis will be known well in advance so that no shortages should occur when the work is ready to be done.

The annual work program estimates the kind and amount of work to be done in the next fiscal year. The managers and 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?

The annual work program is prepared once a year and 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.

The Department should develop the annual work program and report on the planned and accomplished work on a monthly and annual basis using the Hansen computerized maintenance management system.

A sample of an annual work program is presented in the exhibit following this page. It presents a partial annual work program for the Water Supply and Distribution Program.

Recommendation #43: The Asset Management Office should work with the first-line supervisors of the Department and with the Information Technology Department to develop an annual work program for each section and division within the Public Works Department that uses the Hansen computerized maintenance management system, and to develop reporting systems to report budget to actual.

(11) The Asset Management Office Should Develop Formal Work Planning and Scheduling Systems for Each of the Programs.

This task would involve the development of formal work scheduling systems for the sections and divisions within the Public Works Department within the Hansen computerized maintenance management system.

After the annual work program and budget is approved, managers and supervisors must have a simple method of authorizing and scheduling work to ensure that the work program is carried out as planned. Usually bi-weekly schedules should be prepared, using the annual work calendar as a guide within Hansen computerized maintenance management system.

To the extent possible, the planned work should be carried out and every effort should be made to stay on schedule. If activities such as water main repairs and cleanup turn out to be greater than planned, the work program will have to be adjusted.

To ensure that field crews perform only the authorized work, work-orders should typically be prepared within Hansen computerized maintenance management system by the first-line supervisor to authorize work on a day-to-day basis. Each work order should authorize a crew to perform a specific amount of work on a specific activity.

The preparation of these bi-weekly schedules and work orders should be accomplished within the Hansen computerized maintenance management system. The Asset Management Office should work with the first-line supervisors in the Department and with the Information Technology Department to develop and deploy the formal work planning and scheduling systems within Hansen computerized maintenance management system.

Sample Annual Work Program

Work Activity	Quantity	Inventory Unit	Effort Level	Work Quantity	Work Unit	ADP	Crew Days	Crew Size	Labor Days	Labor \$	Equip. \$	Mat'l \$	Total \$
Program: 07 – 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: 08 – Water Distribution Preventive Maintenance													
Valve Exercising	2,300	Valve	.5	3188	Valve	25	128	2	256	\$77,968	\$3,586	\$0	\$81,555
Fire Hydrant Maint.	1,300	Hydrant	1	9,409	Hydrant	20	470	1	470	\$143,284	\$6,789	\$0	\$150,073
Program Totals									726	\$221,253	\$10,375	\$0	\$237,628

Note: Figures and dollar amounts in this Annual Work Plan and Performance Report are examples and do not reflect requirements or staffing levels in the City of Beverly Hills and are used for demonstration purposes only.

Recommendation #44: The Asset Management Office within the Public Works Department should work with the first-line supervisors of the Department and the Information Technology Department to develop and deploy formal work planning and scheduling systems using the Hansen computerized maintenance management system.

(12) The Asset Management Office Should Develop a Written Policy and Procedure That Defines the Priorities for Assigning and Completing Work Orders.

As will be noted earlier in this chapter, the staff of the Water Supply and Distribution Program do not appear to be completing work orders that capture most of their labor hours and work activities. Any interpretations extracted from the work orders that have been completed should, therefore, be interpreted with caution. Nevertheless, the Matrix Consulting Group performed an analysis of work activities completed by the staff assigned to maintenance and repair of the water distribution system (the staff assigned to the reverse osmosis plant do not complete work orders).

The analysis indicates that the work performed by the Program in the maintenance and repair of the water distribution program does not reflect appropriate priorities. New construction, for example, appears to receive a higher priority than preventive maintenance. The table below presents a distribution of labor hours by work activity for a six-week sample in 2015.

Activity	Hours (Regular)	Hours (Overtime)	Number of Work Orders
Fire Hydrant Installation	237.0	0.0	2.0
CIP Water Operation	105.0	82.0	2.0
Repair / Rebuilt 2" Clay Valve	52.0	0.0	2.0
Curb Stop Valve Replacement/Repair	44.0	0.0	4.0
L1 Water Meter Upgrade	39.0	0.0	2.0
Fire Hydrant Damaged	34.0	0.0	5.0
Meter Leak Test	23.5	0.0	20.0
Curb Stop Valve Replacement/Repair 1.5"-2"	17.0	0.0	1.0
Meter Reads/Final Reads	15.8	0.0	17.0

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Activity	Hours (Regular)	Hours (Overtime)	Number of Work Orders
Meter Box Replacement	14.0	0.0	7.0
Stuck Meter Investigation	12.0	0.0	15.0
Stuck Register Investigation	12.0	0.0	11.0
Water Meter Replace/Repair	11.0	0.0	8.0
Meter Lid Replacement	6.0	0.0	6.0
Finance Locate Meter	5.0	0.0	4.0
Shut Off Notice Delivery	4.5	0.0	3.0
Service Call - Meter Box Leak	4.0	0.0	4.0
Curb Stop Service/Replace 3/4" to 1"	4.0	0.0	1.0
Water Other	3.8	0.0	6.0
Service Call - Low Pressure (Meter)	3.0	0.0	3.0
Service Call - On/Off Meter	3.0	0.0	3.0
Turn on/off Water Service Due to Non Payment	3.0	0.0	3.0
Service Call - Main Break	3.0	0.0	2.0
Leak Detection	3.0	0.0	1.0
Service Call - Locate Meter	2.0	0.0	2.0
Service Call - No Water In	2.0	0.0	2.0
Water Service Turn On	1.8	0.0	2.0
MTU Box Replace/Reprogram	1.0	0.0	1.0
Water Service Lateral Leak	0.0	0.0	3.0
Water Meter Leak Repair	0.0	0.0	2.0
Reservoir Maintenance	0.0	0.0	2.0
Install Temporary Meter on Hydrant	0.0	0.0	1.0

As shown in the table, staff of the Water Supply and Distribution Program do not appear to be assigning a higher priority to preventive maintenance than new construction activity. The top two work activities by hours dedicated are construction-focused activities (fire hydrant installation and capital improvement program water operation), which have a higher number of labor hours allocated by the Water Supply and Distribution Program than the rest of the work activities combined.

In fact, the hard copy work order utilized by the Water Supply and Distribution Program does not even contain a field in the form to indicate the priority of the work activity.

While the data in the previous table is incomplete, it suggests that the Asset Management Office, Public Works Department should develop a formal written policy and procedure that provides guidelines the priorities to be assigned by managers and supervisors to priorities to ensure preventive maintenance receives its proper priority: a high priority. Possible criteria for assigning priorities to work orders is presented in the exhibit following this page.

Preventive maintenance should be assigned a higher priority than new construction.

Recommendation #45: The Asset Management Office, Public Works Department should develop a formal written policy and procedure that provides guidelines for the priorities to be assigned by managers and supervisors to work activities.

Recommendation #46: Preventive maintenance should be assigned a higher priority than all other work activities other than emergency repairs.

(13) The Work Order Used by the Water Supply and Distribution Program Should Be Modified.

The work order used by the Water Supply and Distribution Program contains a number of fields including the address, the names of the staff assigned to the work order, the number of hours allocated to completing the work order, the vehicle and equipment numbers used to complete the work order and the number of hours utilized, the types of parts used and their quantity, meter information (if relevant), work done / comments.

The work order lacks a number of fields including a standard activity definition (e.g., exercise <16" distribution valves), the priority of the work, the performance measure for the number of units completed (e.g., the number of <16" distribution valves that were exercised), a category definition for the work activity (e.g., scheduled

maintenance, preventive maintenance, scheduled corrective maintenance, unscheduled corrective maintenance, etc.).

Recommendation #47: The Asset Management Office, Public Works Department should revise the work order used by the Water Supply and Distribution Program to include a standard activity definition (e.g., exercise <16” distribution valves), the priority of the work, the performance measure for the number of units completed (e.g., the number of <16” distribution valves that were exercised), a category definition for the work activity (e.g., scheduled maintenance, preventive maintenance, scheduled corrective maintenance, unscheduled corrective maintenance, etc.).

(14) The Asset Management Office Should Develop a Monthly Performance Report Using Information Contained Within the Hansen computerized maintenance management system.

This last step in the deployment of Hansen computerized maintenance management system involves the development of a work reporting system. Laptops and the Work Order module in the Hansen computerized maintenance management system should be used to track labor, equipment, and materials used for maintenance activities. These work orders should also be used to report the amount of work done and the locations of work as well as the resources used. Normally, these are completed at the end of each day, or at the end of each job if more than one activity is performed during the day.

The first-line supervisors of the units in the Department should promptly review the daily work reports to ensure that they were completed properly and to determine if the performance standards were substantially followed. Significant variations should be followed up to determine the cause and, if necessary, take corrective action.

A system should be developed in the Hansen computerized maintenance management system to summarize the daily work reports on a monthly basis and produce performance reports.

An example of a monthly report is presented below.

Work Activity	Labor Days		Amount of Work		Total Cost		Productivity	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Program: XX – Water Distribution Preventive Maintenance								
Valve Exercising	92	96	2,300 Valves	2,212 Valves	\$21,344	\$22,272	25 valves per crew day	23 valves per crew day
Hydrant Maint.	65	56	1,300 Hyd'ts	1,124 Hyd'ts	\$15,360	\$13,888	20 hyd'ts per crew day	20 hyd'ts per crew day

These monthly reports should be used to evaluate the performance of the sections and divisions in the Department, and monitor progress toward accomplishing the annual work program for each section and division. Again, significant deviations from the planned work program and budget should be investigated and appropriate follow-up action taken.

Without evaluation and control to ensure that the plan is followed, the entire maintenance management effort will be in vain. The performance measurement data generated by this report would include:

- 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.

The intent of the monthly performance report is to report actual accomplishments against the annual work plan.

Recommendation #48: The Asset Management Office within the Public Works Department should work with the first-line supervisors of the Department and

with the Information Technology Department to develop and deploy a monthly performance report comparing planned versus actual performance and costs. This monthly report should be developed using Hansen computerized maintenance management system.

(15) The Department Should Acquire Handheld Devices to Enable Crews to Report the Work Accomplished.

Tracking the work accomplished is another important part of an effective maintenance management system. This is unfortunately, a time intensive task given the number of staff involved. Handheld devices can, however, diminish the time and resources required. The use of handheld devices is a common practice in instances in which a computerized maintenance management system has been deployed.

With handheld devices, the staff of the Public Works Department can become mobile, and paperless. This will ensure the ability to manage work orders and other data electronically, and synchronize on demand or automatically on a periodic basis via a wireless network. If the handheld device has scanning capability, the bar coding function could increase accuracy and productivity even further by scanning bar codes on pre-printed asset types or labor, material and equipment codes to eliminate manual data entry. Other features and functionality of these handheld devices include the following:

- Download/upload assigned work orders with priority;
- Track the time worked on an assignment using an automatic start and stop feature;
- Transfer completed work order information (comments, labor, material, other charges) to the Hansen computerized maintenance management system database directly from the handheld device;
- Update lookup data on the handheld device;
- Create new inventory records for areas and equipment on the handheld device,

and transfer this data directly to the Hansen database;

- Create new work orders from the handheld device while performing facility inspections;
- Conduct inventories and update the parts records from the handheld device directly to the Hansen database;
- Issue parts and upload all data from the handheld device at the end of the day;
- Increase efficiency and accuracy utilizing bar coding technology that quickly scans bar codes representing parks, golf courses, or physical assets;
- Display preventive maintenance task sheets on the handheld device; and
- Use a detailed preventive maintenance checklist and record the results directly on the handheld device.

When considering hardware options that can increase system efficiency, wireless technology is an area to consider.

Recommendation #49: The Deputy Director of Public Works - Operational Support should work with the Information Technology Department to develop a budget proposal for fiscal year 2017-18 to acquire and deploy laptops sufficient for all of the vehicles used every day by the crews of the Department.

3. THE CITY SHOULD RETAIN TRUEPOINT SOLUTIONS TO OPTIMIZE AND RE-IMPLEMENT THE HANSEN COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM.

One of the most important misconceptions of maintenance management planning is that it is an engineering process driven by computerized information systems. This is one of the reasons that maintenance management systems become overly expensive to deliver and fail to meet their goals. Like all management and planning processes, maintenance management is multi-disciplinary in nature, and is process and information driven. Information technology has the potential to improve the management of information, but the processes to be automated must be well

understood and supported across the breadth of the Public Works Department organization.

The Matrix Consulting Group recommends a number of steps be taken by the Public Works Department to enhance the likelihood of successful installation of Hansen as a maintenance management system. These steps are presented below.

(1) Establish a Steering Committee within the Public Works Department to Provide Governance for Implementation of Hansen in the Department.

It is important that the Public Works Department demonstrate its commitment to successful implementation of the Hansen computerized maintenance management system as a maintenance management system through the establishment of the steering committee. The Assistant Public Works Director – Infrastructure and Field Operations should chair this committee. The Assistant Public Works Director – Infrastructure and Field Operations should be tasked with promoting the benefits of maintenance management and the Hansen computerized maintenance management system in an enthusiastic way and to obtain the buy-in from the different divisions of the Department.

The Steering Committee should be made up of representatives from divisions that are directly involved in the implementation of the Hansen computerized maintenance management system in the Department, and the Information Technology Department.

The objectives of the steering committee should be established at its inception and should be reviewed on a regular basis to ensure that they remain relevant to current conditions. The objectives for the Steering Committee would be as follows:

- The formulation of the Department's maintenance management system objectives and policies including the deployment of the Hansen computerized maintenance management system;
- Communication with and education of stakeholders on maintenance management-related issues;
- Coordination of internal and external inventory data collection efforts;
- Establish the structure of the inventory database and consideration of linkages between Divisions and to other City information applications e.g., Munis, ESRI, etc.;
- Consideration of the establishment of work activity definitions, service levels, work activity guides, annual work programs, reporting systems, etc.;
- Recommendation of the staff and computer resources necessary for the successful and timely installation of the maintenance management system, and the subsequent resources to ensure its routine operations; and
- Review and approval of the maintenance management proposed work plan, and guiding metrics.

Recommendation #50: The Public Works Department should establish a Steering Committee to provide governance for implementation of the Hansen computerized maintenance management system in the Department.

(2) The Asset Management Office Should Be Assigned Responsibility for Coordination of the Installation of the Hansen Computerized Maintenance Management System and the Maintenance Management System.

The Asset Management Office should be directly charged with the coordination of the organization, establishment, and installation of the Hansen computerized maintenance management system and the associated maintenance management system in support of the steering committee. The initial one to two years will require a significant amount of direct effort to establish a fully functional maintenance management program, and will require ongoing leadership and management of a project manager. That should be the Asset Management Office. Specifically, the Asset Management Office will need to coordinate the following:

- Implementation of the Hansen computerized maintenance management system in the Public Works Department with the assistance of the Information Technology Department;
- Development of the initial inventory data collection plans;
- The design of a range of asset management related reports;
- Training of the staff in the Public Works Department that are expected to contribute to the asset management plan; and
- Training for Department staff and stakeholders regarding the Hansen computerized maintenance management system and the maintenance management system (in association with Information Technology Department).

Once Hansen computerized maintenance management system and the maintenance management system are installed, this role and the associated workload should diminish. The Asset Management Office should work with the various divisions and the division managers in the Public Works Department to coordinate the installation of the Hansen computerized maintenance management system and the maintenance management system, with the approval of the Steering Committee.

Recommendation #51: The Asset Management Office should be assigned responsibility for coordination of the ongoing organization, establishment, and installation of the Hansen computerized maintenance management system and the associated maintenance management system in support of the steering committee.

(3) The Public Works Department Should Appoint Division Liaisons for the Installation of the Hansen Computerized Maintenance Management System and the Maintenance Management System.

Even though the Asset Management Office will be responsible for coordinating the department-wide installation of the Hansen computerized maintenance management system and the maintenance management system, it is recommended that each division manager (e.g., Solid Waste Manager) that will utilize the Hansen computerized maintenance management system and the maintenance management

system be responsible for the successful installation of Hansen computerized maintenance management system and maintenance management system in their own division. This includes ensuring that all work is being properly captured in the Hansen computerized maintenance management system – inventory data and work order data.

The Hansen computerized maintenance management system and maintenance management system related tasks for each division liaison would include elements of the following (these will likely require specific training in each area):

- Developing and maintaining division-level asset inventories, valuations, and estimates of remaining asset life;
- Ensuring that maintenance data developed by staff of the Division is accurate e.g., work orders, materials used data, equipment utilization data, etc.;
- Developing work activities, performance standards, scheduling system work activity definitions, service levels, performance standards, annual work programs, reporting systems; and
- Ensuring the active use of the Hansen computerized maintenance management system as a maintenance management system e.g., to plan and schedule work, to achieve the objectives and service levels identified in the annual work program, that employees use work orders to record their work for their entire shift, etc.

Most of the above tasks would not be considered overly technically challenging or time consuming (once adequate training has been provided), and should be included in the annual department planning process.

Recommendation #52: The Public Works Department should appoint division liaisons for the installation of the Hansen computerized maintenance management system and the maintenance management system.

(4) The City Should Retain TruePoint to Optimize and Re-Implement the Hansen Computerized Maintenance Management System on a Phased Basis for Implementation.

The City has already expended approximately \$2.5 million in the acquisition and implementation of the Hansen computerized maintenance management system. These expenditures have not resulted in the successful deployment of the Hansen computerized maintenance management system.

The City issued a request for proposal for re-implementation and optimization support of the Hansen computerized maintenance management system. TruePoint was selected to provide these services. Subsequently, TruePoint prepared a Statement of Work to document the services to be delivered, the price of the requested services, and the roles and responsibilities of the various parties responsible for their portion of the delivery.

The proposed price amounts to \$1.167 million. The proposed price is significant.

However, the City should retain TruePoint to assist in the re-implementation and optimization support of the Hansen for the first phase. That phase should include Enterprise GIS and Engineering Division GIS, wastewater (storm and sewer), water, Facilities Services, warehouse, and customer service. The cost for this assistance would approximate \$443,705.

Subsequently, the Public Works Department should proceed on its own with the re-implementation and optimization of the Hansen computerized maintenance management system based upon the support of the Asset Management Office and the Information Technology Department. It should also place TruePoint on retainer to assist

the City in subsequent phases of re-implementation and optimization of the Hansen computerized maintenance management system as necessary.

As necessary, the City should utilize limited-term positions within the Information Technology Department to assist with the re-implementation and optimization of the Hansen computerized maintenance management system subsequent to the first phase.

Recommendation #53: The City should retain TruePoint to assist in the re-implementation and optimization support of the Hansen for the first phase. That phase includes Enterprise GIS and Engineering Division GIS, wastewater (storm and sewer), water, Facilities Services, warehouse, and customer service. The one-time cost for this assistance would approximate \$443,705.

Recommendation #54: Subsequently, the Public Works Department should proceed on its own with the re-implementation and optimization of the Hansen computerized maintenance management system based upon the support of the Asset Management Office and the Information Technology Department. It should also place TruePoint on retainer to assist the City in subsequent phases of re-implementation and optimization of the Hansen computerized maintenance management system as necessary.

Recommendation #55: As necessary, the City should utilize limited-term positions within the Information Technology Department to assist with the re-implementation and optimization of the Hansen computerized maintenance management system subsequent to the first phase.

7. ANALYSIS OF PREVENTIVE MAINTENANCE

A proactive water supply and distribution program utilizes preventive maintenance procedures to minimize rehabilitation or replacement impact, extend the useful age of water supply and distribution assets, enhance water quality, and reinforce the system's overall reliability. Predictive testing and inspection, fire hydrant testing, meter registration accuracy testing, valve management, and cross-connection testing are examples of preventive maintenance methods to be undertaken by the utility.

1. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD INITIATE A PREDICTIVE TESTING AND INSPECTION PROGRAM FOR CRITICAL MECHANICAL ASSETS.

Predictive testing and inspection of critical water assets is conducted utilizing a variety of technologies including vibration analysis, infrared thermography, oil analysis, electrical analysis, and ultrasonic measurements. These technologies can warn of most mechanical problems in time to minimize unexpected failure. This is a proactive approach that is used to detect failures before these failures occur, failures that would likely not be detected by a preventive maintenance program alone. Most preventive maintenance is designed to address only basic maintenance issues, not to eliminate failures. Detection of failures before the failures occur is the intent of the predictive testing and inspection program.

The benefits of predictive testing and inspection include:

- Increase equipment utilization and life;
- Minimize the disruption to the buildings and its occupants;
- Reduce maintenance costs - both parts and labor – for avoidable breakdowns;
- Allow safe elimination of a significant amount of preventive maintenance; and

- Minimize the cost and hazard to equipment as a result of unnecessary overhauls and disassembly and inspection preventive maintenance.

Predictive testing and inspection cannot:

- Eliminate equipment defects and problems, or stop machines from deteriorating;
- Eliminate all preventive maintenance;
- Reduce Water Supply and Distribution Program staffing levels or produce a major decrease in lifetime maintenance costs without a commitment to eliminating defects and chronic problems.

Past studies have estimated that a properly functioning predictive testing and inspection program can provide a savings of 8% to 12% over a program utilizing preventive maintenance alone. Depending on the extent of reliance on reactive maintenance, savings opportunities exceeding 30% to 40% could be realized. In fact, surveys indicate average savings from initiation of a predictive testing and inspection program as follows

- Return on investment - 10 times;
- Reduction in maintenance costs - 25% to 30%;
- Elimination of breakdowns - 70% to 75%;
- Reduction in downtime - 35% to 45%; and
- Increase in production - 20% to 25%.⁹

Savings will vary, however. For example, an electrical predictive testing and inspection program may yield net savings more quickly than a vibration predictive testing and inspection program.

⁹ Federal Energy and Management Program, Operations and Maintenance Best Practices: A Guide to Achieving Operational Efficiency, 2010

The recommended methodologies that should be utilized for the predictive testing and inspection program are presented below.

- **Vibration monitoring.** Vibration monitoring is an analysis of system and equipment vibration levels. It is the most common predictive testing and inspection technique. Machinery and system vibration is the periodic motion of a body about its equilibrium position. Vibration monitoring helps determine the condition of rotating equipment and structural stability in a system. The machinery that vibration testing should be utilized for include motors, pumps, turbines, compressors, engines, bearings, gearboxes, agitators, fans, blowers, and shafts. In this machinery, vibration monitoring is used to monitor potential defects such as wear, imbalance, misalignment, mechanical looseness, bearing damage, belt flaws, sheave and pulley flaws, gear damage, flow turbulence, cavitation, structural resonance, and fatigue. Studies by the U.S. Navy have found probabilities of detection as high as 0.92 and as low as 0.76. Initially, Vibration monitoring is typically performed on critical rotating equipment on one to three month intervals. Once baselines have been established and initial problems have been addressed, the frequency of monitoring should be optimized on an equipment-specific basis, but not less than annual monitoring,
- **Infrared thermography.** Infrared thermography is the application of infrared detection instruments to identify pictures of temperature differences. Because Infrared thermography is a non-contact technique, it is especially attractive for identifying hot / cold spots in energized electrical equipment. Infrared thermography identifies degrading conditions in electrical systems such as motor control centers. Routine infrared inspections should typically be performed on 6-month intervals. Once baselines have been established and initial problems have been addressed, the frequency of monitoring should be optimized based on the type of equipment being monitored and its criticality of the asset, but not less than annual monitoring, The Water Supply and Distribution Program contracts with an electrician to conduct infrared thermography of its pump stations.
- **Motor circuit analysis.** Motor circuit analysis measures natural electrical motor circuit characteristics such as Individual phase resistance from bus disconnect through the motor windings, Inductance of the motor coils, and a capacitance of each phase to ground. A motor circuit analysis test set can provide indications of circuit problems directly in electrical terms that can be used by maintenance personnel to pinpoint and correct faults. The test set may then be used to perform post-repair tests. Motor circuit analysis on critical facility motors is performed at varying frequencies from 12-months to 36-months, depending on equipment size and application. On other motors, it is used on an as-needed basis, and particularly to troubleshoot issues identified from vibration analysis, infrared or ultrasound.

- **Lube oil analysis.** Lube oil analysis is used to quantify and track bearing and lubricant condition in driving and driven equipment. Periodic oil sampling and analysis on critical rotating equipment is typically performed on 3 to 6 month intervals. Once baselines have been established and initial problems have been addressed, the frequency of monitoring is optimized. As part of this program, lube oil analysis results are used to determine proper oil change intervals.

The benefits from a predictive testing and inspection program are demonstrable in many public and private sector organizations. The City should initiate the program with vibration monitoring and lube oil analysis using contractors.

Recommendation #56: The Water Supply and Distribution Program should initiate a predictive testing and inspection program for critical mechanical water assets utilizing contractors.

2. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD PREVENTIVELY MAINTAIN FIRE HYDRANTS IN ACCORDANCE WITH AMERICAN WATER WORKS ASSOCIATION STANDARDS.

The American Water Works Association developed a standard for Distribution Systems Operation and Management.¹⁰ That standard indicates a number of requirements for distribution system management including preventive maintenance of fire hydrants. The standard indicates that “the utility shall have a fire hydrant maintenance and fire flow testing program. Testing and maintenance shall comply with the requirements of AWWA Manual M17. This program shall include as a minimum the following elements:

- The goal for the number of fire hydrants to be inspected and tested based upon a percentage of the total hydrants in the system;
- Procedures for opening and closing hydrants to minimize potential damage to the distribution system; and
- Fire-flow testing requirements.

¹⁰ American Water Works Association, Distribution Systems Operation and Management, 2004

The Water Supply and Distribution Program does not preventively maintain the City's 1,200 fire hydrants; it only replaces hydrants as they are damaged or destroyed. For hydrants, the Water Supply and Distribution Program should remove the gate cap for the associated hydrant isolation valve, shut the hydrant off, open the ports to ensure the gate is working, grease and lubricate the fire hydrant stem if needed, turn the hydrant on, take a pressure reading, and paint the hydrant and gate cap.

There are 1,305 fire hydrants in the City's water distribution system. The preventive maintenance of fire hydrants on an annual basis, as recommended by the American Water Works Association, should require six staff months as noted below.

Work Activity	Units	AWQ	ADP	Annual Crew Days	Crew Size	Annual Staff Days
Fire Hydrant preventive maintenance	Fire Hydrants	1,305	12.0	108.8	1	108.8

The Water Supply and Distribution Program has sufficient authorized positions to provide this service at this service level.

Recommendation #57: The Water Supply and Distribution Program should preventively maintain fire hydrants on an annual basis removing the gate cap for the associated hydrant isolation valve, shutting the hydrant off, opening the ports to ensure the gate is working, greasing and lubricating the fire hydrant stem if needed, turning the hydrant on, taking a pressure reading, and painting the hydrant and gate cap.

3. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD PREVENTIVELY MAINTAIN AIR RELEASE VALVES IN ACCORDANCE WITH AMERICAN WATER WORKS ASSOCIATION STANDARDS.

Air valves are hydromechanical devices designed to automatically release or admit air during the filling, draining, or operation of a water pipeline or system. The safe operation and efficiency of a pipeline are dependent on the continual removal of air from the pipeline.

The American Water Works Association developed a standard for Air Release, Air / Vacuum, and Combination Air Valves.¹¹ That standard states that “air valves that operate continuously should be opened and flushed more often than valves used for filling and draining. All air valves should be opened and flushed at least annually. Air valves should be inspected at least annually for leakage, and the resilient seats should be replaced as necessary.”

There are 93 air release valves in the in the City’s water distribution system. The inspection and preventive maintenance of air release valves on an annual basis, as recommended by the American Water Works Association, should require one-half staff month as noted below. A two-person crew size is recommended as it is presumed that most air release valves are located in the street and not offset from the main in the parkway.

Work Activity	Units	AWQ	ADP	Annual Crew Days	Crew Size	Annual Staff Days
Air release valve preventive maintenance	Air Release Valve	93	12.0	7.8	2	15.5

The Water Supply and Distribution Program has sufficient authorized positions to provide this service at this service level.

Recommendation #58: The Water Supply and Distribution Program should preventively maintain air release valves on an annual basis opening and flushing, inspecting for leakage, and replacing the resilient seats as necessary.

¹¹ American Water Works Association, Air Release, Air / Vacuum, and Combination Air Valves, AWWA Manual M 51, 2001

3. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD PREVENTIVELY MAINTAIN CLA- VALVES ON AN ANNUAL BASIS.

The City's water distribution system has thirteen pressure zones. The cla-valves deliver water at a regulated pressure from the upper to the lower pressure zones. The cla-valves open only when necessary to prevent excessive pressure in the upper pressure zones. The City has one hundred fifty (150) cla-valves.

In the period between April 22, 2015 and December 31, 2015, a total of thirteen (13) cla-valves received maintenance. Of the thirteen (13) cla-valves, twelve (or 92%) were re-built (e.g., hytrol valve, pressure reducing controls, etc.). It is apparent that the cla-valves have not been preventively maintained for a lengthy period of time.

Cla-valves should be cleaned, and exercised annually by the staff of the Water Supply and Distribution Program. The valves which isolate the pressure reducing valves should be exercised and painted. Flushing of all the plumbing should be performed and well as confirmation of proper operation. Upstream and downstream pressures should be taken and recorded.

All cla-valves should be re-built on a 5-year schedule at which time the valves should be disassembled and inspected, any worn parts replaced, and the valve reassembled before returning to service; this service should be provided contractually.

A two-person crew should be used for this work activity since, in most instances, these valves are located in vaults. The inspection and preventive maintenance of pressure reducing valves on an annual basis should require seventy-five staff days annually as noted below. This does not include rebuilding cla-valves.

Work Activity	Units	AWQ	ADP	Annual Crew Days	Crew Size	Annual Staff Days
Pressure Relief Valve Preventive Maintenance	Valve	150	4	37.5	2	75

The Water Supply and Distribution Program has sufficient authorized positions to provide this preventive maintenance service at this service level (this does not include re-building the cla-valves on a 5-year cycle).

Recommendation #59: The Water Supply and Distribution Program should preventively maintain cla-valves on an annual basis by exercising the valves, painting the valves, flushing of all the plumbing and confirmation of proper operation, and recording of upstream and downstream pressures.

Recommendation #60: All cla-valves should be re-built on a 5-year schedule, at which time the valves should be disassembled and inspected, any worn parts replaced, and the valve reassembled before returning to service; this service should be provided contractually.

4. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD ESTABLISH A COMMERCIAL WATER METER REGISTRATION ACCURACY TESTING PROGRAM.

The purpose of commercial water meter testing is to assure accuracy of the meter as commercial water meters register a much greater water usage, and thus represent a proportionally larger revenue mechanism as compared to residential meters. One city that tested the registration accuracy of its meters found that approximately 5.4% of total water consumption was not recorded due to meter inaccuracy.

The American Water Works Association recommends that meters from 1" to 3" be tested once every four years and meters 4" and larger be tested annually. Commercial and industrial meters are classified as those 3" and greater – the City has 554 of these meters. The City has as many commercial meter as many cities with three to four times the population as Beverly Hills.

At the testing frequency recommended by the American Water Works Association, the City would need to test the registration accuracy of 436 meters

annually. The Matrix Consulting Group recommends that commercial meters be tested for registration accuracy, and, based upon the results, the frequency of testing be lengthened to a longer period than that suggested by the American Water Works Association.

According to American Water Works Association, meters 1.5" to 2" cannot be field tested per se and require replacement. Meters larger than 3" and greater should be field-tested every one to three-years dependent upon size. Generally, 15% to 20% of the commercial and industrial meters require rebuilding.

This service should be provided contractually, initially. After the initial contractual testing, the City should provide this service with its own Water Supply and Distribution Program staff. A two-person crew should be used for this work activity. The inspection and preventive maintenance of commercial meters on an annual basis, as recommended by the American Water Works Association, should require the equivalent of one staff year, as note din the table below.

Work Activity	Units	AWQ	ADP	Annual Crew Days	Crew Size	Annual Staff Days
Commercial Meter Testing	Meter	436	4.0	109.0	2	218.0

The Water Supply and Distribution Program has sufficient authorized positions to provide this service at this service level.

Recommendation #61: The Water Supply and Distribution Program should test the registration accuracy of commercial water meters on an annual basis. This should initially be performed contractually, but should be provided with in-house staff subsequently.

5. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD BE HELD ACCOUNTABLE FOR RESOLVING STUCK METERS WITHIN ONE BUSINESS DAY OF RECEIPT OF A SERVICE REQUEST FROM THE ADMINISTRATIVE SERVICES DEPARTMENT.

The Matrix Consulting Group was provided with a list of stuck meters. Work orders have been opened in the Hansen computerized maintenance management system to replace these meters, but have not been closed. Many of these open work orders date to April 2016. Many of these stuck meters are commercial meters: 2 inch meters or larger. In one instance, the stuck meter was a 6-inch meter. While the volume of stuck meters (N=56) is not significant relative to the total number of water meters, many are commercial meters and could potentially be affecting revenue that the Water Enterprise Fund would receive.

The Water Supply and Distribution Program should develop a formal written policy and procedure that stuck meters will be inspected and replaced or repaired within one business day of being reported to the program by the Administrative Services Department. In addition, the Program should be held accountable for reporting to the Deputy Director – Infrastructure and Field Operations – regarding the status of each stuck meter that is still an open work order in the Hansen computerized maintenance management system. If the meter is still stuck, the Program should repair or replace the stuck meter by the end of August 2016.

Recommendation #62: The Water Supply and Distribution Program should develop a formal written policy and procedure that stuck meters will be inspected and replaced or repaired within one business day of being reported to the program by the Administrative Services Department.

Recommendation #63: The Water Supply and Distribution Program should be held accountable for reporting to the Assistant Director – Infrastructure and Field Operations – regarding the status of each stuck meter that is still an open work order in the Hansen computerized maintenance management system. If the meter

is still stuck, the Program should repair or replace the stuck meter by the end of August 2016.

6. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD PREVENTIVELY MAINTAIN WATER DISTRIBUTION VALVES AT THE LEVEL SPECIFIED IN THE AGREEMENT WITH THE DIVISION OF DRINKING WATER PROGRAMS, STATE WATER RESOURCES CONTROL BOARD.

The City has an agreement with the Division of Drinking Water Programs, State Water Resources Control Board that requires the Water Supply and Distribution Program to exercise not less than 150 water distribution valves monthly or 1,800 valves annually. The City has 1,496 butterfly valves and 2,259 gate valves. Meeting the requirements of the Division of Drinking Water Programs, State Water Resources Control Board would result in all of the City's valves being exercised in a two-year cycle.

This requires that staff completely operate the valve (close and re-open) and counting the turns based on valve size, paint the valve box to identify the opening direction and the position of the valve.

In 2015, the Program exercised 1,598 valves.

A one-person crew should be used for this work activity on residential streets, but a two-person crew should be utilized for arterial streets. The inspection and preventive maintenance of pressure reducing valves, in compliance with the requirements of the Division of Drinking Water Programs, State Water Resources Control Board, should require the equivalent of one staff year annually as noted below.

Work Activity	Units	AWQ	ADP	Annual Crew Days	Crew Size	Annual Staff Days
Exercise gate valves	Valve	3,755	25.0	150.2	1.5	225.3

The Water Supply and Distribution Program has sufficient authorized positions to provide this service at this service level.

Recommendation #64: The Water Supply and Distribution Program should preventively maintain water distribution valves on a biennial basis by completely operating the valve (close and re-open) and counting the turns based on valve size, paint the valve box to identify the opening direction and the position of the valve.

7. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD DISCONTINUE THE CONTRACT WITH THE COUNTY OF LOS ANGELES FOR ADMINISTRATIVE SERVICES RELATED TO TESTING OF THE CITY'S BACKFLOW DEVICES AND PROVIDE THESE SERVICES ITSELF.

The California Code of Regulations, Title 17, specifies where backflow prevention devices must be installed to protect the public drinking water systems from contamination. Generally, these devices are installed at industrial, commercial, and institutional facilities like hospitals, restaurants, public parks, and auto shops; and at multi-family facilities.

The City requires that commercial, industrial, irrigation, and multi-family facilities install reduced pressure principal assembly devices on their potable water service lines. Fire service lines, at a minimum, must have a double check-detector backflow prevention assembly installed. If chemicals are added to the fire system, a reduced pressure principal assembly device must be installed.

The City currently is paying Los Angeles County \$32 per backflow device to issue notifications to owners of these devices that they are due for inspection. However, there is no follow-up by the County if, and when, these owners fail to send the County a notification that they have been inspected. Nor can the City obtain historical test results for these devices.

The City's contract with the County recently expired, however both parties are continuing to abide by its terms in the interim. At \$32 per device, the contract with the County has resulted in expenditures of approximately \$19,200 annually.

The Matrix Consulting Group recommends that the City not re-enter into a contract with the County and discontinue the services provided by the County. The City should assume the responsibilities for plan checking the installation of backflow prevention devices proposed with new construction and ensure that the devices are tested by certified private backflow prevention device testers on their required cycles. The City should assume the responsibilities for notifying backflow device owners of due dates for device testing, following up on test results, and for assembling test result data for reporting to the State. This would require:

- The City develop and maintain a database containing all of the permitted backflow devices in Beverly Hills;
- A list of those State-certified inspectors will need to be developed and provided to those commercial and industrial businesses with these devices (the Los Angeles County Department of Public Health maintains and updates such a list);
- The City should send out notices annually to the commercial and industrial businesses with these devices requiring testing, along with a list of certified local testers (the City should facilitate this service, not provide the testing and inspection service itself); and
- The commercial and industrial businesses should be required to provide the City with the results of the test and inspection and any repairs to the device. If the device needs to be repaired, the City should follow-up to ensure the device has been repaired.

This is largely a clerical function.

In addition, the Utility should identify the costs associated with administering the backflow device testing program, and charge owners an annual fee per device, much as the County charged the City for these services. Assuming a charge of \$32 per device per year, this would result in an estimated \$19,200 in revenue for the Utility.

Recommendation #65: The Water Supply and Distribution Program should discontinue the contract with the County for administering its backflow device testing program and assume these duties itself.

Recommendation #66: The Water Supply and Distribution Program should adopt a fee for backflow prevention testing to recover the costs associated with administration of the program, and begin charging owners of backflow devices for the administration of the program.

8. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD RE-ISSUE A REQUEST FOR PROPOSAL FOR MAINTENANCE AND REPAIR OF THE SCADA SYSTEM.

The Water Supply and Distribution Program has outsourced the maintenance and repair of its SCADA system. The contractor retained under contract is skilled and knowledgeable.

However, the contractor is a small business with few employees, and serves a number of other water utilities. As a consequence, the response time to service requests by the Water Supply and Distribution Program are lengthy.

The Water Supply and Distribution Program should re-issue a request for proposal for maintenance and repair of the SCADA system. The requests for proposal should specify that the contractor shall begin maintenance for any escalated malfunction within two (2) hours of notification by City, and shall start immediately and work continuously until the problem is resolved no later than forty-eight (48) hours from notification. A malfunction should be defined as any part of the SCADA system which does not perform as designed.

The request for proposal should state that any escalated malfunction identified by City as an emergency that is not repaired within forty-eight (48) hours of notification to the contractor on the malfunction, shall incur liquidated damages in the amount of \$1,500 / day to be paid by contractor to the City, unless such delay is otherwise excused by the City in writing. The request for proposal should state that in the event

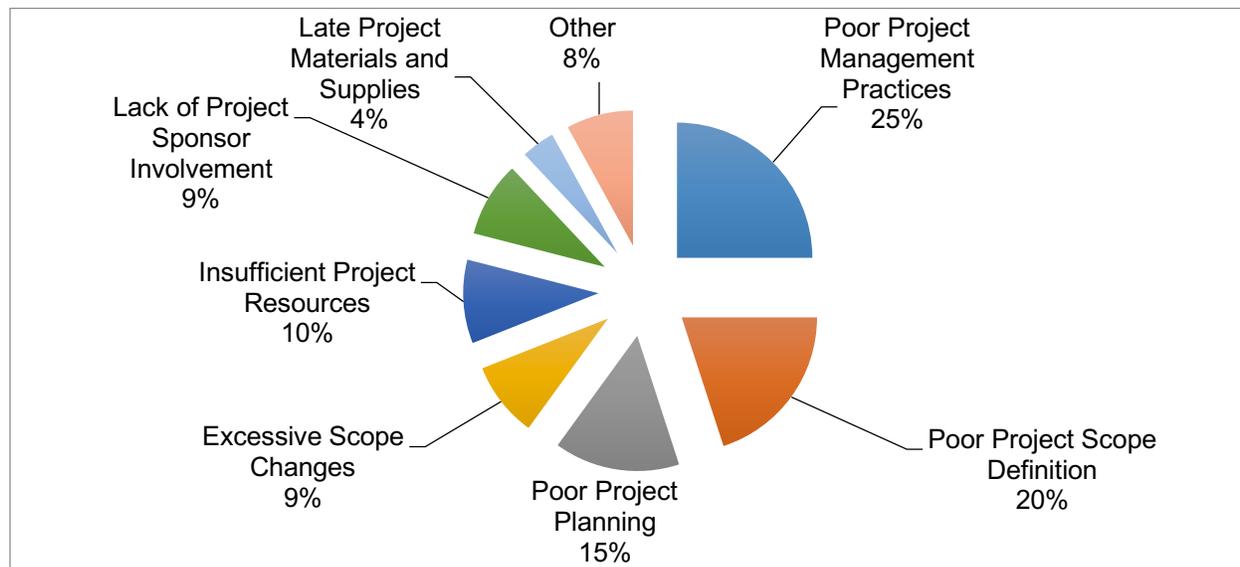
the contractor does not commence repairs within two (2) hours after notification, the City shall have the right but not the obligation, at any time thereafter to notify the contractor of such non-performance and, if the emergency repairs have not commenced within one (1) hour from the notification by the City to the contractor of said non-performance, then the City shall have the right to call in any qualified service organization to perform the necessary repairs and the contractor shall be responsible for the payment, or reimbursement to the City, of such emergency service.

The request for proposal should state that service for any malfunction shall be available twenty-four (24) hours per day, seven (7) days per week, 365 days per year.

Recommendation #67: The Water Supply and Distribution Program should re-issue a request for proposal for maintenance and repair of the SCADA system.

8. ANALYSIS OF ENGINEERING

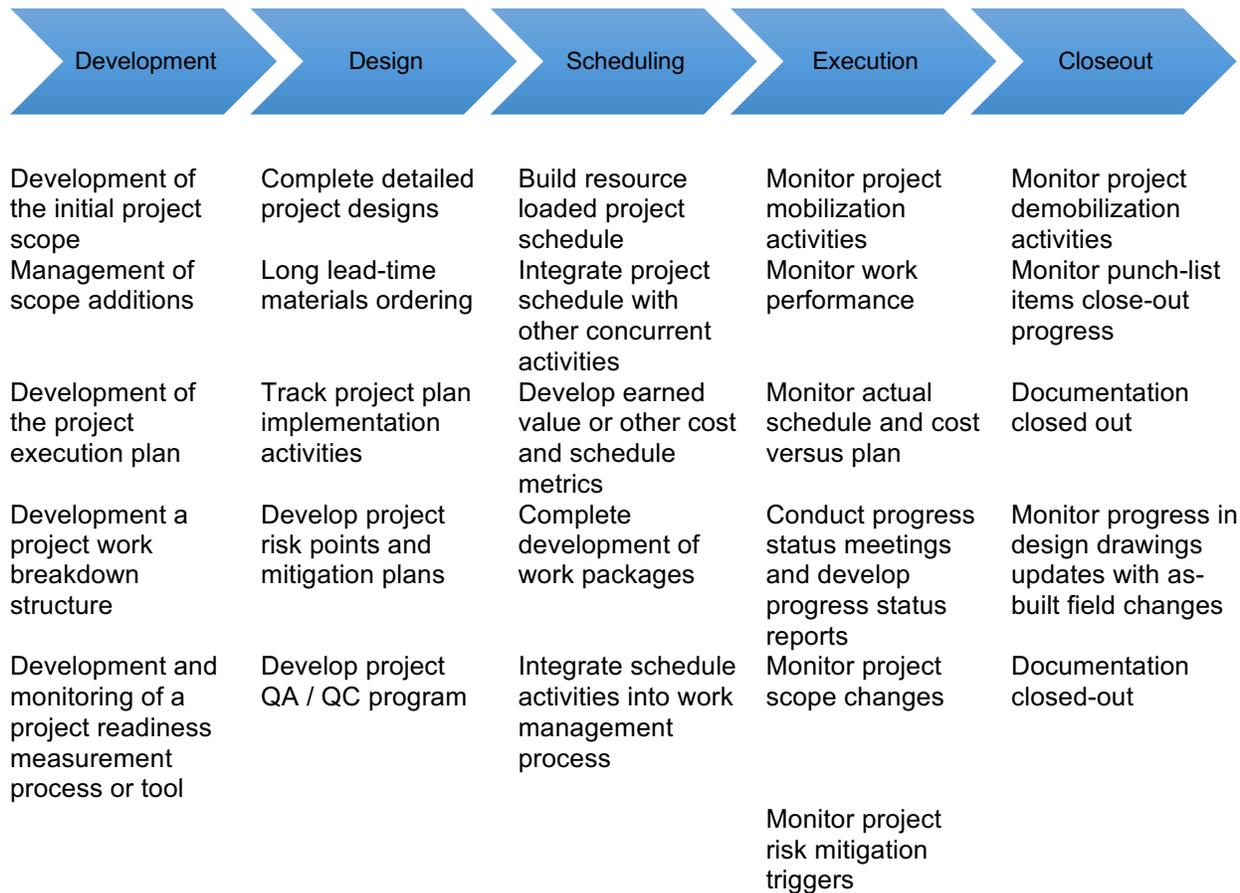
Typical critiques of project management for capital projects results for a wide variety of project types indicate the following sources for project failures as noted in the chart below.¹² This chart represents typical problems found in cities, not just Beverly Hills.



Overall, the process for managing capital projects is the cause of 69% of project failures. This includes such processes as ineffective project planning, ineffective project management, etc.

In evaluating the project management practices used by the Engineering Division, the Matrix Consulting Group used a system approach as depicted in the chart below.

¹² The source of the data contained within the chart in the chart above was the Construction Industry Institute



Some of the elements of project management noted in the previous chart are not present in Beverly Hills. The Matrix Consulting Group recommends a number of enhancements in the project management practices utilized by the Engineering Division. These enhancements are discussed below.

1. THE ENGINEERING DIVISION SHOULD DEVELOP A PROJECT DEVELOPMENT AND MANAGEMENT HANDBOOK.

The American Public Works Association has developed a Public Works Management Practices Manual that presents recommended practices identified by “nationally recognized experts in the field of public works.” Practice 1.4 states “the organization’s policies, practices, and procedures are periodically reviewed and / or

updated to reflect actual practices. Definitive guidelines are provided to employees to accomplish their assigned tasks.”¹³

The Engineering Division has not developed a *Capital Improvement Projects Development and Management Handbook*. The Division should develop such a handbook to provide guidance to its staff regarding how the Engineering Division expects its staff to develop and manage capital projects on schedule and on budget.

The manual includes a number of topics including Budget and Concept Report, Preliminary Design Plans, Property Acquisition and Final Plans, Bid and Contract Award Phase, how Engineering Division should manage capital projects etc.

The Capital Improvement Projects Development and Management Handbook should address the process to be utilized for managing projects and the technical aspects of project and construction management. The process aspects that should be included in the policies and procedures manual are presented below.

- **Initiating and aligning the Matrix Consulting Group that will be utilized for project delivery.** This includes developing a clear understanding of the purpose and goals of the project, developing a project description, identifying the members of the team, the major milestones, the boundaries of the project (scope control), the team roles and responsibilities, the measures of success for the project, and operating guidelines. The deliverable would be a project initiation and alignment worksheet.
- **Planning the work of the project.** This would involve the development of the project plan. The project plan should include a work breakdown structure based upon a master deliverable list developed for the City’s project delivery (i.e., project definition, consultant request for proposals, project finance plan, construction cost estimate, project management plan, design development, value engineering, etc.), development of a risk management plan (deciding how to

¹³ American Public Works Association, Public Works Management Practices Manual, 2004.

approach, plan, and execute risk management activities), developing a communication plan, developing a change management plan (for scope control), developing a quality plan, and developing a transition and control plan. The project plan should be scalable based upon the size of the project.

- **Endorsing the plan.** This involves gaining the commitment to the project management plan by the Matrix Consulting Group, and City management.
- **Working the plan.** This involves actively managing the execution of the project in terms of design, construction management, and construction inspection. It includes managing the scope, the schedule, and the budget, the risks associated with the project, change, and communicating progress with the project.
- **Transition and closure.** This involves acceptance of the work, demobilization, financial closure, development of a written “lessons learned,” and development of “as built” drawings and archiving.

While it is important for the policies and procedures manual to describe the process of managing a capital project, the manual also needs to address the technical aspects of managing a project. This should include such aspects as noted below.

- Design consultant selection.
- Design consultant contract administration;
- Design coordination and review;
- Developing construction cost estimates;
- Advertising and award of construction projects;
- Constructability review of designs by Construction Inspection;
- Initial guidance to the construction contractor (i.e., pre-construction meeting, submittals, pay requests, etc.);
- Public relations during construction;
- The Construction Inspectors daily report;
- Construction quality control;
- Materials testing;

- Project files;
- Project acceptance; and
- Project warranty procedures.

By including these policies and procedures within a *Capital Improvement Projects Development and Management Handbook*, it creates a reference tool for training of Engineering Division staff.

The Engineering Division should develop a capital improvement program project management manual to assure the capital projects are managed efficiently, the necessary resources to accomplish the projects' objectives are allocated, and the potential for cost or schedule overruns is minimized.

Recommendation #68: The Engineering Division should develop a *Capital Improvement Projects Development and Management Handbook*.

Recommendation #69: The Engineering Division should develop an on-line version of the *Capital Improvement Projects Development and Management Handbook* (i.e., the guide should be published to the Division's Intranet).

2. THE RESPONSIBILITIES OF THE ENGINEERING DIVISION IN THE MANAGEMENT OF CAPITAL PROJECTS SHOULD BE CLEARLY SPELLED OUT IN A FORMAL WRITTEN POLICY AND PROCEDURE

The *American Public Works Association* has developed a *Public Works Management Practices Manual* that presents recommended practices identified by "nationally recognized experts in the field of public works." Practice 11.1 states "organizational policies assign engineering design responsibilities for infrastructure. Agencies may be organized in various ways, ranging from individual functions to

departments with a range of responsibilities. Policies should state who is responsible for design and define when professional consultants are utilized. ”¹⁴

The proposed roles and responsibilities for the Engineering Division in the management of capital projects are presented below.

- Preparation of plans and specifications for capital projects, either with their own staff or through consulting engineers retained and managed by Engineering Services;
- Managing the design of the capital projects including preparation of project scoping plans, critical path method schedules, staffing plans for the design and construction management of the projects, monitoring the performance of consulting engineers, processing the payment requests of consulting engineers, etc. so that the design occurs within the budget and schedule defined within the project scoping plans;
- Coordination of the design review at 30% / 60% / 90% design completion by Construction Inspectors with the construction inspectors, project owner (e.g., Water Supply and Distribution), etc. for technical accuracy, constructability, compliance with the master plan, etc.;
- Coordination of the advertising and award of construction contracts and the acquisition of right-of-way;
- Managing the construction of capital projects including providing initial guidance to contractors through pre-construction meetings, review of product submittals from construction contractors, review of construction contractor progress payment requests after the requests are approved by the construction inspector assigned to the capital project, reviewing the daily reports, final on-site inspection before acceptance of the project from the construction contractor, coordination of warranty repair requests made to the construction contractor, etc.

These responsibilities are summarized in the exhibit following this page.

¹⁴ American Public Works Association, Public Works Management Practices Manual, 2004.

**Management Requirements For
Capital Projects**

Component of the Capital Improvement Process	Requirement
Planning and Organizing the CIP	Preparation of project scoping plan for each CIP project to define the financing, description, scope, design considerations, and the necessary coordination with outside agencies.
	Preparation of a network schedule for each project, including duration time for each task, and earliest and latest start and finish times.
	Preparation of bar chart schedules for the entire CIP for a 2-year period showing projected timing of planned projects by major project component (e.g., design, bid, award, construction, etc.).
	Projection of staffing requirements to handle planned, prioritized projects for next fiscal year, including workload loading on a monthly basis.
	Leveling of resources to enable the development of schedules based on available staffing.
Project Management	Management of capital improvement projects in accordance with the project scoping plan.
Project Monitoring and Reporting	Reporting via the time accounting system of actual staff-hours by skill level and position type on CIP projects to provide the basis for: <ul style="list-style-type: none"> • Monitoring of staff and contractor performance against guidelines during each phase of the process; • Monitoring actual versus projected staff needs; and • Development of a database to utilize in refining project workload estimates. Time accounting system includes an hourly rate that accounts for indirect time and Division-wide overhead.
	Reporting of the project status on a monthly basis, including status of staff hours planned vs. actual.
	Reporting of financial and schedule status of each project showing expenditures and schedule to-date versus the project scoping plan.
	Recommending within the monthly status report steps that can be taken to enable completion of projects on schedule and within budget.
	Communication to top management, within the monthly status report, of CIP projects that will not be completed on schedule and within budget, along with estimated completion dates and budgets for each of these projects.

These roles and responsibilities should be published in a formal policy and procedure developed by the Engineering Division, reviewed with the Assistant Public Works Directors and the Public Works Director, Office of the City Manager, and adopted as a departmental policy and procedure, and “posted” or published to the Department’s intranet.

Recommendation #70: The City Engineer should develop a formal written policy and procedure that clarifies responsibility for managing all of the engineering aspects of the delivery of the City’s capital projects from “cradle to grave” as being assigned to the Engineering Division.

3. A SUMMARIZED TWENTY-FOUR MONTH BAR CHART SCHEDULE SHOULD BE PREPARED FOR ALL CAPITAL PROJECTS.

This schedule should portray start and finish dates for each capital project by simple activity descriptions for design, bid package preparation, advertise/award, right-of-way acquisition, environmental impact evaluation, 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 based upon the five-year capital improvement program.

Recommendation #71: A summarized twenty-four month bar chart schedule should be prepared for all capital projects that will be designed and scheduled by the Engineering Division.

4. THE ENGINEERING DIVISION SHOULD DEVELOP PROJECT WORK PLANS.

The *Construction Industry Institute* has defined a number of best practices for managing capital improvement programs.¹⁵ Among these best practices is pre-project planning.

¹⁵ CII Best Practice Guide: Improving Project Performance, Version 3.1, Construction Industry Institute, 2011.

The Engineering Division should prepare a project work plan. This should be utilized for pre-project planning. It should include a number of features including:

- CIP number;
- CIP project title / description including a narrative summary description of the project, specific physical improvements included, the location of the project, and the relationship to master plans;
- Project goal;
- Types of work (e.g., asphalt paving, water main, sanitary sewer, etc.);
- A task breakdown with task – start month and task – end month;
- Right-of-way acquisition requirements;
- Environmental impacts.
- The financing, including the source of funds and appropriation status;
- A budget covering the project broken down by design staffing, construction inspection staffing, etc., appropriate consultants, utility relocation, etc., by major expenditure component, staff hour requirements by work breakdown structure and the costs (staff-related, consulting, permits, etc.);
- 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 consulting engineer;
 - Environmental evaluation 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;
 - Other key responsibilities that need to be assigned and/or accomplished;
- The extent of coordination necessary with external agencies such as County Department of Health, identifying who the coordination will be required of during the planning, design and construction of the capital project, the nature of the coordination, and the key contacts;

- The preliminary schedule for completing the planning, design and construction of the capital project including the schedule for planning, design, bid package preparation, advertise / award, right-of-way acquisition, and construction and including the dates of important events such as approval of the award of construction contract by the City Council, using a work breakdown structure via Microsoft Project;
- The measures of success for the project in terms of what the project manager must accomplish for the project to be successful and the measures of success for the team (e.g., bringing the project in on schedule and on budget);
- A risk assessment to identify the risks or threats associated with the execution of the project, the response strategy, and how the risk would be monitored and tracked;
- A communication plan for external and internal communication regarding the project including the responsibilities and mechanisms for the communication and when the communication should occur;
- How the quality of the project will be achieved including the standards, methods of verification that standards are met during construction, constructability reviews during design, etc.; and
- How the project will be transitioned to Infrastructure and Field Operations upon completion of construction and how the project will be closed out upon completion of construction (e.g., as-built designs, archiving of records, acceptance of work completed by the construction contractor, etc.).

A project plan should be developed for each capital project, and scaled to fit the size, complexity, and dollar value of the project. The project plan should define the project deliverables, schedule and budget plans, and the management methods used by the Engineering Division.

Recommendation #72: The Engineering Division should develop project plans to include a project description, financing, budget, responsibility for completing the various components of the capital project, extent of coordination necessary with external agencies, measures of success, a risk assessment, communication plan for external and internal communication, how the quality of the project will be achieved, how the project will be transitioned to Infrastructure and Field Operations upon completion; etc.

5. THE ENGINEERING DIVISION SHOULD UTILIZE COST OF CONSTRUCTION GUIDELINES AS THE BASIS FOR PROJECT PLANS.

Capital projects are most amenable to effective cost management in the early stages of the project and the least in the construction stage. If budgets are not well defined early, project costs will increase as the project progresses. A consistent approach to budgeting practices throughout the various phases in the life of a project can reduce or help manage the uncertainties in project development that can increase project costs.¹⁶

Cost of construction guidelines should be used as a budgeting tool to determine the number of staff hours required for design and construction inspection and to evaluate whether projects are being managed and executed efficiently. The exhibit presented following this page presents an example of cost of construction guidelines for the design and inspection of streets capital improvement projects as a percentage of construction costs.

Percentage of construction cost has been widely used for determining the cost of design and inspection of various works.

For example, the *California Multi-Agency CIP Benchmarking Study* has been benchmarking the costs of planning, design, and construction management / inspection for nine (9) years measuring these costs as a percentage of the costs of construction.¹⁷ The participating agencies include the cities of Long Beach, Los Angeles, Oakland, Sacramento, San Diego, San Jose, and the City and County of San Francisco.

¹⁶ City of Seattle, Washington, Capital Improvement Program Study of Seattle Transportation, 2001.

¹⁷ California Multi-Agency CIP Benchmarking Study, September 2010

Cost of Construction Guidelines for Streets Capital Projects

Type of Project	Street Reconstruction			Street Overlay / Seal Coat
	\$0.3 to \$0.6 million	\$0.6 to \$1.3 million	\$1.3 to \$2.4 million	\$0.3 - \$0.6 million
Construction Cost (+/-)	\$0.3 to \$0.6 million	\$0.6 to \$1.3 million	\$1.3 to \$2.4 million	\$0.3 - \$0.6 million
Planning and Scoping	0.9%	0.9%	0.8%	0.5%
Design Development	24.2%	19.2%	17.8%	3%
Design Survey	2.8%	1.7%	1.6%	0%
Design Administration	3.7%	3.5%	3.2%	2%
Construction Survey	3.7%	2.6%	2.4%	0%
Construction Inspection	9.3%	8.7%	8.1%	5%
Construction Management	5.6%	5.2%	4.9%	2%
Project Closure	0.7%	0.2%	0.2%	0.4%
Total	51.0%	42.0%	39.0%	12.9%

Performance benchmarking involves “collecting documented project costs and plotting the component costs of project delivery against the total construction cost. The objective of this exercise is to develop relationships between these variables by performing regression analyses. Since *Update 2009*, the results of the regression analyses have yielded significantly better correlation compared to prior years of the *Study*. This is primarily due to the adoption of statistical techniques for model selection and vast improvements in the modeling methodology.” The analysis included elimination of “outliers”. The total project delivery percentage of each project in the database was evaluated against all other projects in the same classification. An outlier was identified as a project whose total project delivery percentage was outside the range.

However, the Engineering Division should develop its own cost of construction guidelines. It should consider the performance of other public agencies such as those reflected in the *California Multi-Agency CIP Benchmarking Study* and use the results of benchmarks of its own performance, but develop cost of construction guidelines that reflect the complexities and nuances of capital project management by the Division.

The City of San Jose has already adapted the benchmarks from the *California Multi-Agency CIP Benchmarking Study* and developed their own cost of construction guidelines with examples noted below.

Project Type	Total Construction Cost	Delivery Cost Target
Pressure Systems (Water Mains)	\$0.1 million to \$0.5 million	35%
	\$0.5 million to \$0.9 million	35%
	> \$0.9 million	34%
Pump Stations	\$0.1 million to \$0.7 million	53%
	\$0.7 million to \$3 million	50%
	> \$3 million	44%

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

- These guidelines should be customized to fit the different types of construction jobs such as street construction, street reconstruction, traffic control, water and sewer.
- These guidelines should be 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 should resource requirements for each work activity associated with a project. These include design development, design administration, etc.
- If a consulting engineer is accomplishing the design, the project manager in the Engineering Division would utilize the guideline for design administration, and not design development.

The project managers within the Engineering Division should determine the staffing requirements for each project in terms of person hours required for design and construction inspection utilizing the cost of construction guidelines. This should be accomplished in the preparation of the Project Plan. The project managers should utilize the cost of construction guidelines in the preparation of the staffing requirements before each fiscal year to determine workload capacity of staff versus the workload represented by the capital projects.

Recommendation #73: The Engineering Division should utilize cost of construction guidelines to determine the staffing requirements for each capital improvement program project in terms of person hours required for design and construction inspection.

6. THE ENGINEERING DIVISION SHOULD ESTABLISH A “GATE” MEETING PROCESS TO ENHANCE COMMUNICATION WITH AND BUY-IN FROM PROJECT OWNERS.

“Gates” are events and a process for the design-bid-build process to ensure that critical project tasks have been completed as a prerequisite to moving forward through

the Project Planning to Design to Construction phases. “Gate meetings provide an excellent forum for elevating issues for reconciliation between Project Owners (e.g., the Assistant Public Works Director - Infrastructure and Field Operations) and the Engineering Division Matrix Consulting Group so that the project can move forward. Gates require the Engineering Division Project Manager to report out to the Project Owner and Engineering Division management as to what decisions have been made on projects, what has been completed, what problems have been encountered, the status of actual versus planned schedule and budget, etc.

A gate process advances communication and buy-in from Project Owners on the direction of the project and the health of the budget and schedule before the Engineering Division Matrix Consulting Group is ready to move past a gate so that costly downstream changes are avoided.

The table below presents a list of the recommended “gates”.

Gate #	Timing of Gate Meeting
Gate 1	Entry – draft Project Initiation Plan
Gate 2	Project Scope Approval (Approval of the Project Plan)
Gate 3	30% Design
Gate 4	60% Design
Gate 5	100% Design
Gate 6	Construction Documents Ready for Bid
Gate 7	Punchlist Stage of Construction
Gate 8	Project Closeout

The intent of these “gate” meetings are to:

- Confirm that collaborative reviews and buy-in by Project Owners is occurring as capital project delivery is progressing;
- Bring together the Engineering Division Matrix Consulting Group, Project Owners and Engineering Division management at project milestones to discuss issues before a capital project moves forward;

- Provide a project status summary; and
- Mitigate changes in scope late in the project. Once agreements are reached at a gate meeting and a capital project moves forward, requests by Engineering Division Matrix Consulting Group members, Project Owners and / or Engineering Division management to add or change project elements are too late and will not be addressed.

The desired outcomes of the “gate” meetings are to confirm that:

- Work by the Engineering Division Matrix Consulting Group to date is satisfactory;
- Risks to the project budget and the project schedule are controlled;
- Scope, schedule, cost and quality are appropriately managed by the Engineering Division Matrix Consulting Group;
- The change management process is being followed by the Engineering Division Matrix Consulting Group;
- Capital project plans, going forward in design and construction, are sound;
- The Project Owner remain committed to the project;
- “Lessons learned” are discussed and documented at each gate with an eye towards opportunities for strengthening project management and gate meeting processes.

The possible agenda for each “gate” is presented in the exhibit following this page. The role of the Engineering Division project manager in these “gate” meetings is to:

- Ensure that gate materials are completed;
- Ensure that reports and information are distributed in advance to the Engineering Division Matrix Consulting Group, Project Owners and Engineering Division management;
- Identifies follow-up actions, if any (what, who and when) and ensures actions are completed;
- Distributes “gate” meeting summary minutes to all invitees;
- Posts gate materials and minutes as identified in the process maps to the project management information system.

The role of the of the Engineering Division Matrix Consulting Group, Project Owners and Engineering Division management at the “gate” meeting is to:

- Represent the Engineering Division and the Project Owner on behalf of their organization and have the authority to make decisions regarding the project on behalf of their organization;
- Review “gate” meeting materials in advance and come to the meeting informed;
- Concur with progress or raises issues; and
- Act on any follow-up issues requested by the Engineering Division Project Manager.

The typical “gate” meeting should focus on:

- Updates on key project issues as identified in previous “gate” meetings;
- Management of and recovery plans related to potential risks to maintenance of scope, schedule, cost and/or quality;
- Updated project cost and schedule highlighting any significant changes; and
- Lessons learned to date: what is going well and what has been unexpected.

There are three possible outcomes to the “gate” meetings: the Project Owner (1) approves the project to move forward without conditions; (2) approves the project to move forward after conditions identified in the “gate” meeting are met; or (3) the project is denied approval to move forward. In the latter case, the Project Owner needs to determine whether the project is still active, on hold, or cancelled.

Recommendation #74: The Engineering Division should establish a “gate” meeting process to enhance communication with and buy-in from Project Owners.

Recommendation #75: “Gate” meetings should be conducted at the initiation of the capital project, project scope approval (or approval of the final Project Initiation Plan), 30% design, 60% design, and 100% design, punchlist stage of construction, and project closeout.

Possible Agenda for “Gate” Meetings

Gate #	Timing of Gate Meeting	Agenda for Gate Meeting
Gate 1	Entry	<p>Establishes joint ownership of the project and the Project Plan by the Engineering Division Matrix Consulting Group, the Project Owner and Engineering Division management for the success of the project</p> <p>Assures the need for the project is validated by the Project Owner and clearly understood by the Engineering Division Matrix Consulting Group</p> <p>Confirms that project scope, delivery method, schedule, cost and quality are reasonable and achievable and funding sources are available via a draft Project Initiation Plan</p> <p>Commits necessary Engineering Division design and construction management / inspection resources to achieve scope, schedule, budget and quality</p> <p>Initiates plan for managing potential risks to maintaining scope, schedule, cost and quality</p>
Gate 2	Project Development (Project Initiation)	<p>Review and approval of amended Project Initiation Plan by the Engineering Division Matrix Consulting Group, the Project Owner and Engineering Division management, including scope, schedule, budget and quality based upon feedback after the Gate 1 meeting</p>
Gate 3	30% Design	<p>Confirms Engineering Division Matrix Consulting Group, the Project Owner and Engineering Division management agree that current scope, schedule, cost, and quality are still reasonable and achievable</p> <p>Provides updates by the Engineering Division Matrix Consulting Group on:</p> <ul style="list-style-type: none"> Management of potential risks to maintaining scope, schedule, cost and/or quality; Current cost and schedule estimate and any possible revisions to budget and schedule; Permits submittals and approvals; Environmental issues; Underground Utilities; Right-of-way acquisition; Long-lead items; and Any other critical path items. <p>Presents lessons learned to date</p>
Gate 4	60% Design	
Gate 5	100% Design	

Gate #	Timing of Gate Meeting	Agenda for Gate Meeting
Gate 6	Plan, Specification, and Estimate Documents Ready for Bid	<p>Engineering Division Matrix Consulting Group, the Project Owner and Engineering Division management verify that project is ready to proceed to contractor selection</p> <p>ROW & permits are acquired, if needed; Environmental and underground utility clearances are obtained; Contract documents (plans, specifications and estimate) are accepted; and All funding is secured and available.</p> <p>Confirms Engineering Division Matrix Consulting Group, the Project Owner and Engineering Division management agree that current scope, schedule, cost and quality are still reasonable and achievable.</p> <p>Updates Engineering Division Matrix Consulting Group, the Project Owner and Engineering Division management of potential risks to maintaining scope, schedule, cost and quality</p> <p>Presents lessons learned to date</p>
Gate 7	Punchlist Stage of Construction	<p>Punchlist has been issued</p> <p>Warranties established</p> <p>Lessons learned are updated</p>
Gate 8	Project Closeout	<p>Demonstrates that project is fully completed and closed. For example:</p> <p>Final inspection report completed; As-built drawings completed; Documents are turned over to records storage and scanned; All information regarding the project cost and schedule have been entered into and quality controlled within the Project Management Information System completed, if used; Completed Project Report prepared; Final payment issued, retention released & financial records closed; Permits closed; Request made to close project in Munis Financial System.</p> <p>Discusses opportunities for strengthening the project management and gate meeting processes based on lessons learned during project delivery</p>

Recommendation #76: The facilitator of the “gate” meetings should be the project manager assigned to the capital project by the Engineering Division.

7. THE ENGINEERING DIVISION SHOULD UTILIZE THE PROJECT ACCOUNTING SYSTEM IN MUNIS TO TRACK THE COSTS ASSOCIATED WITH DESIGN, INSPECTION AND CONSTRUCTION MANAGEMENT OF CAPITAL PROJECTS.

The Engineering Division does not utilize a project accounting system within the City’s financial system (Munis) to capture the staffing costs associated with the design and inspection of capital projects.

The Engineering Division project managers should input all of the costs associated with a capital project, including their own labor hours, into the system for all projects. The project cost accounting system should be utilized to document all of the costs associated with the design, construction inspection, and construction management of capital projects including the construction contracts.

Recommendation #77: The Engineering Division should utilize the City’s project accounting system in Munis to track the costs associated with the design and inspection of capital projects.

8. THE ENGINEERING DIVISION SHOULD PREPARE A RESOURCE-LOADED PROJECT SCHEDULE FOR EACH FISCAL YEAR.

The Project Management Institute published a *Guide to the Project Management Body of Knowledge* (PMBOK Guide). Principle 6.5 indicates that among the generally recognized good practices for project management includes the development of a project schedule. The development of a schedule “is the process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule. Entering the activities, durations, and resources into the scheduling tool generates a schedule with planned dates for completing project activities. Schedule

development can require the review and revision of duration estimates and resource estimates to create an approved project schedule that can serve as a baseline to track progress.”¹⁹

A resource-loaded schedule is designed to ensure that the Engineering Division is capable of meeting its commitments – the completion of the design of funded capital projects.

Before the beginning of each fiscal year, the City Engineer should prepare a resource loaded project schedule for all of the capital projects that will be designed and inspected during that fiscal year. The intent of the resource loaded project schedule is to make sure that sufficient staff or consultant resources are available to complete these projects or, if not, to adjust schedules to accommodate the resources available.

An example of the application of cost-of-construction guidelines for the construction management and inspection of one capital project is provided in the table below.

1. Project Title	Langsford Road, Todd George to old City Limits
2. Project Description:	This project involves the construction of Langsford Road including a four-lane arterial roadway, curbs and gutters, sidewalks, and major drainage structures.
3. Construction Cost:	\$3,600,000
4. Construction Duration (Months):	15.61
5. Start Date	01-Apr-017
6. Finish Date:	28-Oct-17
7. Complexity:	Average
8: Cost of Construction Guidelines:	
• Construction Inspection	4%
• Construction Management	2%
9. Staff Hours Required	
• Construction Inspection (\$70 / hour)	2,057.14
• Construction Management (\$90 / hour)	800.00
• Total Construction Staff Hours	2,857.14

¹⁹ Project Management Institute, A Guide to the Project Management Body of Knowledge, 2008.

This analytical effort would need to be completed for each project that would be designed or inspected during the upcoming fiscal year. The total staff hours would need to be loaded on a project-by-project basis for the months that the project will be designed or inspected during that fiscal year (although the project could extend beyond the end of that fiscal year). In the example noted above, the project would need to be loaded for the months beginning April 2017 through the end of the fiscal year or June 2017 (although the project would continue until the end of October 2017). A total of 2,057 hours would need for construction inspection to be loaded over a 15 plus month construction schedule or approximately 132 staff hours per month. This indicates that this project would likely require a full-time Construction Inspector for the duration of this project.

Recommendation #78: The City Engineer should prepare a resource loaded project schedule for all of the capital projects that will be designed and inspected during that fiscal year.

9. THE ENGINEERING DIVISION SHOULD IMPROVE ITS PROJECT STATUS REPORTS TO COMPARE ACTUAL PROGRESS VERSUS THE PLANNED SCHEDULE AND THE ACTUAL COST VERSUS THE PLANNED BUDGET.

The Project Management Institute published a *Guide to the Project Management Body of Knowledge* (PMBOK Guide). Principle 10.5 indicates that among the generally recognized good practices for project management includes the reporting of performance. “Report performance is the process of collecting and distributing performance information including status reports, progress measurements, and forecasts. The performance reporting process involves the periodic collection and analysis of baseline versus actual data to understand and communicate the project

progress and performance as well as to forecast the project results.”²⁰

The Engineering Division should prepare a monthly capital improvement program project status report. The report should include a number of data regarding each project including the following:

- Charge number;
- Project number;
- Project title;
- Project description;
- Total budget amount, as defined in the Project Plan, and the current revised budget;
- Design budget;
- Design expenditures to date separately identifying staff expenditures from consulting expenditures (using the project cost accounting system);
- Construction management expenditures to date separately identifying contract administration, construction inspection, and consulting engineering expenses (using the project cost accounting system);
- Construction cost as budgeted (using the project cost accounting system);
- Current construction cost as estimated by the project manager responsible for construction management (using the project cost accounting system);
- Design project manager;
- Construction project manager;
- Design start date – original and revised;
- Design completion date – original and revised;
- Construction start – original and revised;
- Construction end – original and revised; and

²⁰ Project Management Institute, A Guide to the Project Management Body of Knowledge, 2008.

- Comments.

These reports should be developed on a monthly basis.

Recommendation #79: The Engineering Division should expand its existing monthly capital improvement program project status report.

Recommendation #80: The monthly capital improvement program project status report should be posted to the Engineering web site each month.

Recommendation #81: The monthly capital improvement program project status report should be used as the basis by the Engineering Division for monthly meetings with Project Owners.

9. ANALYSIS OF STAFFING

This chapter presents an analysis of the staffing of the Water Supply and Distribution Division. In considering staffing, it is important to note that the cost of operations and maintenance staff (excluding the Reverse Osmosis Plant and the Water Enterprise Plan) comprise only 11.2% of the annual costs of the Water Supply and Distribution Program.

1. THE LEVEL OF STAFFING FOR THE MAINTENANCE AND REPAIR OF THE WATER DISTRIBUTION SYSTEM IN BEVERLY HILLS IS LARGELY COMPARABLE TO OTHER CITIES IN TERMS OF STAFF PER 100 MILES OF WATER MAINS.

The Matrix Consulting Group performed a comparative survey of water supply and distribution utilities in cities with similar water distribution characteristics as Beverly Hills. The survey sample included six cities in Southern California, in addition to Beverly Hills, as shown in the following table.

City	Population
Burbank	104,709
Glendale	191,021
Manhattan Beach	35,726
Pasadena	139,731
Santa Monica	92,472
Torrance	147,478
Beverly Hills	34,763

The cities selected provide comparisons to cities with larger population sizes, but very similar water supply and distribution characteristics.

The following table provides a set of descriptive statistics for the water utilities included in the comparative survey, including miles of water distribution pipeline, total water delivered (in acre-feet), and total number of active water accounts. The average

and median for the sample are also provided to show how Beverly Hills compares to the sample.

City	Distribution Miles of Pipeline	Total Water Delivered (AF; most recent FY)	Total Active Water Accounts
Burbank	309	16,836	26,000
Glendale	398	25,177	33,976
Manhattan Beach	110	4,504	13,935
Pasadena	520	26,000	37,500
Santa Monica	250	18,000	11,837
Torrance	320	25,000	26,500
<i>Sample Average</i>	<i>317.8</i>	<i>19,253</i>	<i>24,958</i>
<i>Sample Median</i>	<i>314.3</i>	<i>21,500</i>	<i>26,250</i>
Beverly Hills	171	10,521	11,042

Important points to note regarding the table are presented below.

- The sample group primarily contains cities of a larger population than Beverly Hills. This sample was chosen as a group of cities that demonstrate best-practices with respect to water supply, distribution, and treatment.
- Beverly Hills has the smallest population in the sample, but has more distribution miles of pipeline and significantly more volume of water delivered than Manhattan Beach, and a similar number of active water accounts than Santa Monica and Manhattan Beach.

Information regarding a number of operational statistics was also asked of the sample group, including unaccounted-for (lost) water, pressure zones, active wells for water production, and number of water storage tanks. The results for each city, and the average and median are reported in the following table.

City	Unaccounted-For Water (%)	Number of Pressure Zones	Number of Active Wells	Number of Water Storage Tanks
Burbank	4.2%	16	10	30
Glendale	4.2%	12	14	30
Manhattan Beach	4.0%	1	1	2
Pasadena	8.0%	24	16	16
Santa Monica	5.2%	3	10	4
Torrance	3.0%	3	2	4
<i>Sample Average</i>	4.8%	9.8	8.8	14.3
<i>Sample Median</i>	4.2%	7.5	10.0	10.0
Beverly Hills	6.0%	16	4	10

As shown in the table, despite being among the smaller cities in terms of population and distribution network, Beverly Hills is comparable to the sample in terms of operational characteristics. Important points to note regarding the table are presented below.

- Beverly Hills has above-average and above-median unaccounted-for water among the sample, at 6%. It is the second-highest city in terms of unaccounted-for water, behind only Pasadena, which has 8% loss. The sample average is 4.8% and median is 4.2%.
- Despite having an overall smaller water distribution network, Beverly Hills has an above-average number of pressure zones and is equal to the median in terms of water storage tanks.
- Beverly Hills has fewer active groundwater wells than the sample average or median.

The survey also analyzed statistics regarding the sources of water used by each water utility, presented in the following table. The total amount of water supply is presented by percentage provided by the Metropolitan Water District (MWD), groundwater, recycled water, and purchases from neighboring agencies.

City	MWD	Groundwater	Recycled	Purchase from Neighboring Agencies
Glendale	64%	29%	7%	-
Manhattan Beach	77%	24%	-	-
Burbank	29%	55%	16%	-
Santa Monica	30%	70%	-	-
Torrance	62%	13%	25%	-
Pasadena	58%	41%	-	1%
Beverly Hills	92%	8%	-	-

Beverly Hills purchases the highest percentage of water purchased from MWD in the sample and, accordingly, has the lowest reliance on groundwater. Beverly Hills also does not utilize any recycled water resources unlike Burbank, Glendale, and Torrance.

The comparative survey also included the extent of staff allocated to the maintenance and repair of the City’s water distribution system (excluding water plant operations, engineering, utility billing and cashiering, clerical support, and water quality and environmental compliance). The results on a city-by-city basis are noted below.

- **Burbank.** Burbank Water Systems is authorized sixteen (16) positions for the maintenance and repair of its water distribution system including a Superintendent, supervisors, pipefitter / operators, water meter mechanics, and utility workers and a cross connection control specialist.
- **Glendale.** Glendale Water Services is authorized thirty-nine positions for the maintenance and repair of its water distribution system including an Assistant General Manager, Superintendents, Supervisors, and various other positions such as Water System Mechanics.
- **Manhattan Beach.** Manhattan Beach is authorized seven (7) positions for the maintenance and repair of its water distribution system including a Supervisor and Water Maintenance Workers.
- **Pasadena.** The Pasadena Water Delivery Business Unit is authorized forty-eight (48) positions for the maintenance and repair of its water distribution system including a Superintendent, Supervisors, Caulker and Repair Mechanics, Maintenance Assistants, Laborers, etc.

- **Santa Monica.** The Santa Monica Water Resources Division is authorized twenty-four (24) positions for the maintenance and repair of its water distribution system including an Administrator, Supervisors, Crew Leaders, Equipment Operators, Maintenance Workers, Water Resource Technicians (Meter Mechanics), Field Inspectors (cross connection control specialists), etc.
- **Torrance.** The Torrance Water Services Division is authorized thirty (30) positions for the maintenance and repair of its water distribution system including a Superintendent, Supervisors, and System Operators.

The table below summarizes a comparison of the staff for these cities, the miles of water mains, and the staffing per 100 miles of water mains.

City	Number of Authorized Positions Allocated to Maintenance and Repair	Miles of Water Mains	Authorized Positions Per 100 Miles of Water Mains
Burbank	23	309	7.44
Glendale	39	398	9.80
Manhattan Beach	7	110	6.36
Pasadena	48	520	9.23
Santa Monica	24	250	9.60
Torrance	30	320	9.38
Beverly Hills	15	171	8.77

Overall, the number of authorized positions allocated for the maintenance and repair of the water distribution system in Beverly Hills is comparable to Glendale, Pasadena, Santa Monica, and Torrance, but more than Burbank and Manhattan Beach, when considering the number of authorized positions per 100 miles of water mains.

2. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD FOCUS ITS STAFF RESOURCES ON CORE SERVICE DELIVERY.

The Water Supply and Distribution Program finds itself in a difficult situation regarding its staffing. The level of staffing for the Water Supply and Distribution Program, excluding staff allocated to the implementation of the Water Enterprise Plan and operation of the reverse osmosis plant, is comparable to the metrics reported by the American Water Works Association, as noted previously. However, the Water Supply

and Distribution Program does not deliver a comprehensive preventive maintenance program. The existing levels of service for some of the Program’s core services are insufficient to protect the assets of the City’s water utility.

Given these challenges, making a change in the mix of services offered by the Water Supply and Distribution Program must be considered. This change in the portfolio includes outsourcing some services so that the Program can ensure that adequate staff is available for its core services.

Given the situation, it is imperative that decisions regarding delivery of core services be made in as dispassionate a manner as possible. Doing so helps to reduce the emotion associated with decisions regarding services that will be delivered by staff of the Program versus outsourced so that the staff of the program can concentrate on core services. The experience of the Matrix Consulting Group suggests that the priorities of the Program in delivering core services should be made as noted in the table below.

Priority (1 = Highest)	Maintenance and Repair Type	Description of Maintenance and Repair Type
1	Unscheduled Corrective Maintenance (UCM)	Work orders that require a Water Worker to make unscheduled repairs, remedies on, or replace equipment, systems and structures. Examples include emergency main leaks, stuck water meters, emergency water service leaks, etc.
2	Preventive Maintenance (PM)	These work orders are issued to perform scheduled preventive maintenance or inspections on water supply and distribution equipment to maintain the original anticipated useful life of a water utility asset and include such items as exercising distribution valves, fire hydrant preventive maintenance, cla-valve preventive maintenance, air relief valve preventive maintenance, etc.
3	Scheduled Maintenance (SM)	These are work orders issued to make scheduled repairs, remedies or replacements on buildings, systems and equipment either identified during a PM or scheduled by supervisors that are of a non-PM or non-UCM nature. Examples include meter replacements, MTU replacements, cla-valve re-builds, gate valve replacements,

Priority (1 = Highest)	Maintenance and Repair Type	Description of Maintenance and Repair Type
4	Discretionary Maintenance	These are work orders that is not required for the preservation or functioning of a water utility asset such as installation of new fire hydrants or water services associated with development, water taps, etc.

To assist with obtaining a clear understanding of what core services are, it may be important to define what it is not. The following list includes types of tasks that are not core services:

- Major (cost prohibitive) replacements of equipment or building components consisting of work that is sometime classified “capital replacement,” or deferred maintenance;
- Capital improvement projects (e.g., water main replacement); and
- New equipment installations and related infrastructure support such as new fire hydrants, new meters, or new water services installed as a result of development; and
- Work that is not performed by the staff of the Water Supply and Distribution Program to maintain the skills et of Water Workers.

Work order priorities should be developed in a written policy and procedure and assigned to work orders so that essential core services are delivered (e.g., preventive maintenance of assets to maintain the original anticipated useful life of a water utility asset). Work order priority #3 (scheduled maintenance) and #4 discretionary maintenance) should only be performed when all of the work orders associated with priority #1 (unscheduled maintenance) and #2 (preventive maintenance) have been completed and there are no pending or backlogged priority #1 and priority #2 work orders.

Recommendation #82: The Water Supply and Distribution Program should develop a formal written policy and procedure regarding work order priorities.

Recommendation #83: Priorities should be assigned to work orders so that essential core services are delivered (e.g., preventive maintenance of assets to maintain the original anticipated useful life of a water utility asset).

Recommendation #84: Work order priority #3 (scheduled maintenance) and #4 discretionary maintenance) should only be performed when all of the work orders associated with priority #1 (unscheduled maintenance) and #2 (preventive maintenance) have been completed and there are no pending or backlogged priority #1 and priority #2 work orders.

3. THROUGH ATTRITION, THE WATER SYSTEMS INSPECTOR POSITION SHOULD BE RECLASSIFIED WITHIN THE WATER WORKER CLASSIFICATION SERIES, AND ASSIGNED TO FIELD OPERATIONS CREWS RESPONSIBLE FOR MAINTENANCE AND REPAIR OF THE WATER SUPPLY AND DISTRIBUTION ASSETS.

The City of Beverly Hills is slowly making the transition from dependence on the County of Los Angeles for the administration of its backflow prevention device program to the delivery of this service with its own staff. The City ostensibly has approximately 600 backflow prevention devices.

This is a prevailing practice.

There are start-up costs associated with this transition given the recalcitrant response of the County in providing the database of businesses with backflow prevention devices in Beverly Hills. Making this transition will require the assumption of a number of responsibilities by the City as noted below.

These responsibilities are presented below.

- Beverly Hills must undertake cross connection control programs to protect the public water systems from pollution and contamination.
- Beverly Hills's responsibility for cross connection control shall begin at the water supply source, include all public treatment, storage, and distribution facilities under the its control, and end at the point of delivery to the water user's premise.
- Beverly Hills must develop and implement cross connection control programs that meet the minimum requirements set forth in these rules.

- Beverly Hills must ensure that inspections of approved air gaps, approved devices, and inspections and tests of approved backflow prevention assemblies protecting the public water system are conducted:
 - At the time of installation, any repair or relocation;
 - At least annually;
 - More frequently than annually for approved backflow prevention assemblies that repeatedly fail, or are protecting health hazard cross connections, as determined by the water supplier;
 - After a backflow incident; or
- Beverly Hills must ensure that approved air gaps, approved devices, or approved backflow prevention assemblies, found during an inspection not to be functioning properly to be repaired, replaced or re-plumbed by the water user or premise owner.
- Beverly Hills' cross connection program shall consist of the following elements:
 - Local ordinance or enabling authority that authorizes discontinuing water service to premises for:
 - Failure to remove or eliminate an existing unprotected or potential cross connection;
 - Failure to install a required approved backflow prevention assembly;
 - Failure to conduct the required testing of an approved backflow prevention assembly.
 - A written program plan to include the following:
 - A list of premises where health hazard cross connections exist;
 - A current list of certified cross connection control staff members;
 - Procedures for evaluating the degree of hazard posed by a water user's premise;
 - A procedure for notifying the water user if a non-health hazard or health hazard is identified, and for informing the water user of any corrective action required;
 - The type of protection required to prevent backflow into the public water supply, commensurate with the degree of hazard that exists on the water user's premise;
 - A description of what corrective actions will be taken if a water user fails to comply with the water supplier's cross connection control requirements;

- Current records of approved backflow prevention assemblies installed, inspections completed, backflow prevention assembly test results on backflow prevention assemblies and verification of current Backflow Assembly Tester certification; and
 - A public education program about cross connection control.
- Beverly Hills must prepare and submit a cross connection control Annual Summary Report to the Health Department.
 - Beverly Hills must ensure at least one person is certified as a Cross Connection Control Specialist.

Much of this is one-time work associated with the transition of the program from the County's Health Department to the City's Water Supply and Prevention Program.

Once the program is established, the work is largely clerical as noted below.

- The City should develop and maintain a database containing all of the permitted backflow devices in Beverly Hills. The Water System Inspector needs to accomplish this task. Once the database is developed, it should be maintained by clerical support staff within the Public Works Department.
- A list of those State-certified inspectors will need to be developed and provided to those commercial and industrial businesses with these devices. The County Health Department maintains such a list. This list should be provided on the City's web site or with a link to the County Health Department.
- The City should send out notices annually to the commercial and industrial businesses with backflow prevention devices requiring testing, along with a list of certified local testers. The City should facilitate this service, not provide the testing and inspection service itself. This notice can be automated, and the notices mailed to commercial and industrial businesses with backflow prevention devices by clerical support staff.
- The commercial and industrial businesses should be required to provide the City with the results of the test and inspection and any repairs to the device. These results should be forwarded to the clerical support staff within the Public Works Department, who should maintain the backflow devices database. If commercial and industrial business do not respond, reminder notices should be mailed by the clerical support staff and, ultimately, the commercial and industrial businesses forwarded to Code Enforcement for failure to respond.

The Water Supply and Distribution Program should maintain an employee who is a State-certified backflow device inspector. However, there is simply insufficient ongoing work, once this program is established, to warrant a full-time position.

Through attrition, the Water Systems Inspector should be reclassified within the Water Worker classification series. The position should report to the Field Services Supervisor. The position should be utilized for the maintenance and repair of the water supply and distribution system, but also expected to administer the City's backflow prevention device program as workload requires (e.g., one workday a week).

Recommendation #85: The Water System Inspector should develop and maintain a database containing all of the permitted backflow devices in Beverly Hills. Once the database is developed, it should be maintained by clerical support staff within the Public Works Department.

Recommendation #86: The City should maintain a list of State-certified backflow device inspectors and provided to those commercial and industrial businesses with these devices or a link to the County Health Department, who maintains and updates such a list.

Recommendation #87: The City should send out notices annually to the commercial and industrial businesses with backflow prevention devices requiring testing, along with a list of certified local testers. This notice can be automated, and the notices mailed to commercial and industrial businesses with backflow prevention devices by clerical support staff.

Recommendation #88: The commercial and industrial businesses should be required to provide the City with the results of the test and inspection and any repairs to the device. These results should be forwarded to the clerical support staff within the Public Works Department, who should maintain the backflow devices database. If commercial and industrial business do not respond, reminder notices should be mailed by the clerical support staff and, ultimately, the commercial and industrial businesses forwarded to Code Enforcement for failure to respond.

Recommendation #89: The Water Supply and Distribution Program should maintain an employee who is a State-certified backflow device inspector.

Recommendation #90: Through attrition, the Water Systems Inspector should be reclassified within the Water Worker classification series. The position should

report to the Field Services Supervisor. The position should be utilized for the maintenance and repair of the water supply and distribution system, but also expected to administer the City's backflow prevention device program as workload requires (e.g., one workday a week).

3. THROUGH ATTRITION, THE WATER SYSTEM TECHNICIAN SHOULD BE RECLASSIFIED WITHIN THE WATER WORKER CLASSIFICATION SERIES.

The Water Supply and Distribution Program is authorized a Water System Technician position. This position has a number of responsibilities including those noted below.

- Coordinates meter and fire programs and provides various support services, including usage of STAR system.
- Runs reports for the replacement of meters when meters fail.
- Replaces meter transmission units (MTU).
- Ensures that readings are accurate.
- Checks readings weekly to check for anomalies.
- Performs fire flows and pressure testing and provides results to customers, as requested.
- Enters crews' information from work-orders into Hansen computerized maintenance management system.
- Ensures that new meters are entered into the utility billing program.

Some of these responsibilities should be automated. Entering crews' information from work orders into the Hansen computerized maintenance management system should be automated; crews should be provided with tablets or mobile data terminals and should enter this information into the Hansen computerized maintenance management system themselves. Ensuring that new meters are entered into the utility billing program should be automated through an interface between the Hansen computerized maintenance management system and the utility billing system. The utility

billing system should link to the Hansen computerized maintenance management system to generate reports for the replacement of meters when meters fail (e.g., zero reads).

Other responsibilities belong elsewhere in the organization. The Administrative Services Department is responsible for ensuring that meter readings are accurate and checking readings for anomalies. This is simply part of the utility billing process in every water utility in the United States.

In the mid to long-term, the other responsibilities should be assigned to the Water Workers within field operations in the Water Supply and Distribution Program. This includes replacing meter transmission units, performing fire flows and pressure testing and provides results to customers, as requested, etc.

Through attrition, the Water System Technician should be reclassified within the Water Worker classification series. This position can be more efficiently utilized if the position can perform a myriad of work related to maintenance and repair of water supply and distribution assets, not just water meters.

Recommendation #91: Entering Water Supply and Distribution Program crew information from work orders into the Hansen computerized maintenance management system should be automated; crews should be provided with tablets or mobile data terminals and should enter this information into the Hansen computerized maintenance management system themselves.

Recommendation #92: Ensuring that new water meters are entered into the utility billing program should be automated through an interface between the Hansen computerized maintenance management system and the utility billing system.

Recommendation #93: The utility billing system should link to the Hansen computerized maintenance management system to generate reports for the replacement of meters when meters fail (e.g., zero reads).

Recommendation #94: The Administrative Services Department should continue to be responsible for ensuring that meter readings are accurate and checking readings for anomalies.

Recommendation #95: In the mid to long-term, the other responsibilities of the Water System Technician should be assigned to the Water Workers within field operations in the Water Supply and Distribution Program. This includes replacing meter transmission units, performing fire flows and pressure testing and provides results to customers, as requested, etc.

Recommendation #96: Through attrition, the Water System Technician should be reclassified within the Water Worker classification series. This position can be more efficiently utilized if the position can perform a myriad of work related to maintenance and repair of water supply and distribution assets, not just water meters.

4. THROUGH ATTRITION, THREE WATER WORKER III POSITIONS SHOULD BE ELIMINATED WITHIN THE REVERSE OSMOSIS PLANT WHEN THE SCADA SYSTEM BECOMES FUNCTIONAL AND STAFF ARE FULLY TRAINED IN USING THE SCADA SYSTEM.

The City is investing significant sums of money in its Supervisory Control and Data Acquisition System (SCADA). In fact, City began upgrading the SCADA system in 2015 to address some of the monitoring constraints, and, to date, approximately half of the system has been upgraded.

SCADA provides the potential for automating the control of the water supply and production system, if SCADA is fully functional. SCADA can be utilized for monitoring security, water quality, equipment status monitoring, process control, alarm handling, etc. SCADA allows treatment plants to be operated remotely without on-site staff. Real-time sensors connected to a supervisory control and data acquisition (SCADA) system or equivalent telemetry system can transmit critical performance and operational information to a remote operational center. This setup enables operations or management staff at a remote location (e.g., their residence) to assess the operating

status and performance of a treatment plant and to respond to process or mechanical failures, or other non-routine situations.

This is the approach used by other cities as noted in the table below.

City	Do you staff your operations center at all times (24/7/365)?	Do you use a system (SCADA) to manage the system in off-hours?
Burbank	No	Yes
Glendale	No	Yes
Manhattan Beach	No	Yes
Pasadena	No	Yes
Santa Monica	No	Yes
Torrance	No	Yes
Beverly Hills	Yes	No

All of the cities used SCADA for remote monitoring of their water distribution system.

None of the cities staffed their water operations center around-the-clock.

There are challenges to achieving this remote control. SCADA costs include the capital needed to install sensors and data transfer and storage equipment, maintenance costs for sensors, and monthly costs associated with data transfer and servicing. Another significant issue for real-time monitoring of plants from a remote location is the need to keep on-line sensors clean and calibrated over long periods, which is essential to minimize alarms.

As part of a *Water Environment Research Foundation* study, a small number of treatment plants using real-time remote monitoring were identified in the United States, Canada, Australia, and Europe. In cases where such equipment was currently used, monitoring was typically limited to simple, traditional parameters monitoring the on-off status of mechanical equipment or liquid levels.

Other cities use the functional SCADA system to remotely operate their reverse osmosis plant. Charlotte County, Florida, with a 3.61 MGD design flow that provides the

only source of potable water for 6,915 accounts. The plant is staffed with a chief plant operator and three treatment plant operators that staff the plant 16 hours a day, seven days a week. When the plant is unmanned, the SCADA system alarms the chief plant operator automatically if problems arise with the treatment process or distribution system. The City of Santa Monica similarly operates its reverse osmosis plant with partial shift coverage, relying on their SCADA system for alarms when the plant is unmanned.

The Water Supply and Production Program is authorized a Water System Production / Operations Supervisor and eight Water Worker III positions. Through attrition, three Water Worker III positions should be eliminated when the SCADA system is fully functional, staff have been fully trained in the use of the system, response to alarms, and how to remotely respond to alarms at the plant.

The City is currently required to operate the plant with two positions per shift; this modification in operations and staffing will require the approval.

The annual cost impact of the elimination of these positions is presented below in terms of salary and fringe benefits.

Recommendation	Annual Cost Savings
Three Water Worker III positions should be eliminated after successful implementation of steps to enhance the reliability of the SCADA system within the reverse osmosis treatment plant and reduce the amount of false alarms.	(\$366,000)

Recommendation #97: Through attrition, three Water Worker III positions should be eliminated when the SCADA system is fully functional, staff have been fully trained in the use of the system, the response to alarms, and how to remotely respond and remediate alarms at the plant.

5. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD MORE EFFECTIVELY MANAGE THE USE OF OVERTIME.

The Matrix Consulting Group analyzed the extent of overtime and compensatory hours earned by Water System Workers, the Water System Technician, and the Water System Inspector in for twelve months in 2015-16.

Overall, these staff worked overtime and compensatory hours that ere the equivalent of 21% of their regular hours or 377 hours annually at the median, 90 hours at the 25th percentile, and 561 hours annually at the 75th percentile.

To evaluate the need for overtime, the Matrix Consulting Group reviewed the overtime for one pay period. The reasons for the overtime included MTU replacement (35% of the overtime), West Hollywood fire flow (5% of the overtime), the warehouse (28% of the overtime), and a 2-inch service line abandonment on Wilshire Boulevard (32% of the overtime).

There are legitimate reasons for overtime including 2-inch service line abandonment on Wilshire Boulevard (after business hours) and emergencies such as main breaks. However, MTU replacements would not rise to an emergency nor typically a business necessity.

Overall, the Matrix Consulting Group concludes that the extent of overtime and compensatory overtime far exceeds reasonable amounts.

The Water Supply and Distribution Program should develop a written policy and procedure regarding the proper uses of overtime, and install more rigorous management controls regarding the use of overtime.

Recommendation #98: The Water Supply and Distribution Program should develop a written policy and procedure regarding the proper uses of overtime, and install more rigorous management controls regarding the use of overtime.

10. ANALYSIS OF GIS

This chapter presents an analysis of GIS as it pertains to its use and deployment within the Public Works Department.

Geographic information systems are used by water utilities to more effectively manage their water utility infrastructure. Typical requirements of the water utility include:

- Updating geodatabases with as-built data to keep up-to-date records of the built infrastructure (e.g., mains, valves, water storage tanks, meters, etc.);
- Integrating computer-aided design drawings into the GIS environment as new assets are added or assets are replaced;
- Managing the maintenance and the repair of the infrastructure, such as leaks, repairs, preventive maintenance, and inspections;
- Analyzing installed networks for planning and capital improvement projects;
- Producing standard and custom map products.

GIS enhances with the ability of utility managers to make better decisions and provides confidence in the accuracy as to what is actually in the ground.

1. THE PUBLIC WORKS DEPARTMENT SHOULD COMPLETE THE ASSET REGISTRY FOR WATER SUPPLY AND DISTRIBUTION ASSETS WITHIN THIS FISCAL YEAR.

Not all water supply and distribution assets have been input into the GIS geodatabase. For example, fire hydrants are approximately 95% to 98% complete, backflow prevention devices are approximately 55% complete, pressure reducing valves are approximately 20% complete, water distribution mains are approximately 55% complete, and water meters are approximately 97% complete.

Yet, the Department has been attempting to complete its geodatabase for approximately eight years.

This is a major roadblock to the re-optimization of the Hansen computerized maintenance management system in the Water Supply and Distribution Program or anywhere else in the Public Works Department.

In fact, TruePoint has stated “Before undertaking any other project tasks for ANY other division, it is imperative that Enterprise Asset GIS standards be arrived at for Public Works Assets.” TruePoint cited shortcomings in standardization of GIS data, data governance, administrative oversight (not to mention an enterprise perspective in the use of infrastructure data for the City as a whole).

The effort to develop and update the GIS asset registry has been ongoing for a number of years. It has yet to be completed. And there is not an up-to-date schedule for the completion of the Water Supply and Distribution Program asset registry.

The Civil Engineering GIS Specialist should work with the GIS Coordinator, Information Technology Department to develop and implement a schedule that would result in the completion of the asset registry for the Water Supply and Distribution Program and the syncing of that asset registry with the citywide GIS geodatabase and with the Hansen computerized maintenance management system.

If staff resources are a problem, the Civil Engineering GIS Specialist and the GIS Coordinator, Information Technology Department should work together to marshal sufficient GIS staff resources to complete the asset registry.

Recommendation #99: The Civil Engineering GIS Specialist should work with the GIS Coordinator, Information Technology Department to develop and implement a schedule that would result in the completion of the asset registry for the Water Supply and Distribution Program and the syncing of that asset registry with the citywide GIS geodatabase and with the Hansen computerized maintenance management system.

Recommendation #100: If staff resources are a problem in the completion of the asset registry for the Water Supply and Distribution Program, the Civil Engineering GIS Specialist and the GIS Coordinator, Information Technology Department should work together to marshal sufficient GIS staff resources to complete the asset registry.

Recommendation #101: The geodatabase for the Water Supply and Distribution Program should be completed in fiscal year 2016-17.

2. THE INFORMATION TECHNOLOGY DEPARTMENT SHOULD ESTABLISH A CITYWIDE GIS GOVERNANCE COMMITTEE.

The Information Technology Department should establish a citywide GIS governance committee.

The GIS Governance Committee should be assigned responsibility to guide GIS implementation development for the City. The GIS Governance Committee should meet on a monthly basis; however, as critical strategic issues are resolved, it may need to meet less often. The Information Technology Department should ensure that its GIS Governance Committee consists of upper management staff. A management-level employee from each major department should be on the committee. This committee ensures that GIS is implemented effectively throughout the organization and that citywide-wide goals and objectives are being met.

The GIS Governance Committee would provide a high-level commitment to investment in GIS within the City. Each member of the committee will gain a better understanding of GIS and ownership for the City's GIS Implementation. These participants will be indispensable during budgeting, and each will serve as a champion for GIS within his or her own department. GIS Governance Committee members will see the benefits of GIS, subsequently lobbying for greater utilization of the technology.

Initially, the GIS Governance Committee should address a number of challenges the City faces such as data standards, GIS workflow management, GIS training, etc.

Recommendation #102: The Information Technology Department should establish a citywide GIS governance committee. The GIS Governance Committee should be assigned responsibility to guide GIS implementation development for the City. The GIS Governance Committee consists of upper management staff from major City departments.

2. THE INFORMATION TECHNOLOGY DEPARTMENT AND THE PUBLIC WORKS DEPARTMENT SHOULD DEVELOP A WRITTEN POLICY AND PROCEDURE FOR THE SYNCING OF THE GIS GEODATABASE WITH THE HANSEN ASSET REGISTRY.

HDR completed an assessment of the Hansen computerized maintenance management system in 2014. One of the problems between the GIS geodatabase and the asset registry within the Hansen computerized maintenance management system is that the two systems contain two different registries for the assets under the stewardship of the Public Works Department.

HDR recommended that “the most essential change that can be made to the Hansen system would be to develop a workflow for syncing GIS data with Hansen. It is recommended that plans be entered in the GIS soon after they are received by the engineering division. The asset in the GIS should have an attribute that annotates the sources of the data; it is typical to use plan, as-built, survey, field verified or aerial image (remote sensing). Systems would be synced periodically and is often done as a “job” after work hours; this ensures “up-time” of both the Hansen and GIS systems. It is not uncommon for systems to be synced nightly. However, weekly syncs are often acceptable timeframes in most organizations.”

Recommendation #103: The Information Technology Department and the Public Works Department should work together to develop a written policy and

procedure for the syncing of the Hansen and GIS systems including the frequency of syncing (e.g., daily, weekly, etc.).

3. THE INFORMATION TECHNOLOGY DEPARTMENT AND THE PUBLIC WORKS DEPARTMENT SHOULD WORK TOGETHER TO DEVELOP A WRITTEN POLICY AND PROCEDURE REGARDING THE STANDARDS FOR DATA TO BE INCLUDED IN GIS FOR THE PUBLIC WORKS DEPARTMENT.

Comprehensive and consistent data standards need to be developed in a formal written policy and procedure for the assets to be included in GIS (e.g., the granularity of data such as every bridge joint vs. the entire bridge, or every mile of pavement versus every 0.25 mile of pavement), and the referencing system (e.g. latitude and longitude versus milepoint along a street). Departments do not necessarily need exhaustive data for every type of asset or layer; the selection should be strategic and purposeful. This requires careful thought regarding geodatabase design (e.g., relationships must be established correctly between spatial feature classes) and how to populate and update the database (e.g., how to collect the data and quality control the data) using standard asset management data entry forms.

These would include, for example, technical standards for water supply and distribution asset data to be provided in relation to new assets created as part of a capital project. The policy and procedure would describe the data required and the structure and format it should be supplied in. Examples would include asset hierarchies, asset classifications, the file format for asset hierarchies (e.g., asset input worksheet), removal of existing assets as the assets are removed or replaced, how to add assets to an existing hierarchy, how to enter project capital values, filling in the attributes input worksheet, etc.

The Information Technology Department should work together with the Public Works Department to develop a written policy and procedure regarding GIS data standards so that all location-referenced data collected will be consistent and easily integrated with other GIS data.

These data standards should consider the Hansen computerized maintenance management system and their technical integration including data collection (mobile data collection that is geotagged and quality controlled), storage (citywide ESRI geodatabase that syncs nightly with the Hansen computerized maintenance management system, Cloud computing), analysis (asset management analysis tools, ArcGIS, etc.), and dissemination (e.g., asset management data reports).

Recommendation #104: The Information Technology Department should work together with the Public Works Department to develop a written policy and procedure regarding GIS data standards so that all location-referenced data collected will be consistent and easily integrated with other GIS data; how the data will be collected, geotagged, and quality controlled; how the data will be updated and with what frequency; where the data will be stored; the analytical tools that will be provided for the analysis of the GIS data; and how the data will be disseminated.

4. THE INFORMATION TECHNOLOGY DEPARTMENT SHOULD MAKE MORE EFFECTIVE USE OF THE GIS TOOLS DEVELOPED BY ESRI ON BEHALF OF THE PUBLIC WORKS DEPARTMENT.

ESRI, or the Environmental Systems Research Institute, is the prevailing software used to support geographic information systems. It is the software used by the City of Beverly Hills.

ESRI has developed a number of best practices for utilities to ease the development of a geodatabase and to ensure that the asset data in the GIS is accurate

positionally (in the right place), descriptively (describes the asset appropriately), and temporally (up-to-date).²¹

One of these best practices is the use of ESRI data models to simplify the process of implementing projects and to help promote industry standards to ArcGIS users. The data models provide an excellent starting point in project implementation that can be modified in ArcCatalog. However, the Public Works Department designed the geodatabase for the Water Supply and Distribution Program without using the ESRI water utilities data model.

A second best practice is the use of geometric networks. a set of connected edges (lines) and junctions (points), along with connectivity rules used to represent and model a common network infrastructure. The geometric network allows the Public Works Department to define how edges and junctions connect and how water flows through the network. In a water distribution system, the flow of water is from a reservoir to a customer via various assets such as valves and pump stations. Connectivity rules help define how the features in the network connect to each other. For example, a fire hydrant can only be connected to a service lateral of type hydrant. The Public Works Department is using the geometric network for the sewer assets only at this time.

A third best practice is the use of the ArcGIS Workflow Manager. The ArcGIS Workflow Manager enables the Public Works Department to standardize and formalize its GIS workflows. This is especially important when multiple editors are accessing the GIS data. Out-of-the-box workflows are available within the ArcGIS Workflow Manager

²¹ ESRI, GIS Data Quality Best Practices for Water, Wastewater, and Stormwater Utilities, July 2011

to design, execute, track, and distribute workflows. The Public Works Department is only using the ArcGIS Workflow Manager for the sewer assets only at this time.

A fourth best practice is the use of an ArcSDE geodatabase. An ArcSDE geodatabase enables the Public Works Department to implement an editing workflow that can allow the Department to identify and resolve potential data issues, such as conflicting edits, and perform quality control on recently edited data before all the GIS users and integrated systems see the edits. Versioning is highly beneficial to safeguard the data. A typical use case for versioning is when designing proposed capital projects for additional or replacement assets. The Department may want to use the GIS to model the potential results of placement of pipes, for example. However, the Department will want to isolate the versions for this analysis from the production geodatabase until the capital project is finally built and accepted. By isolating these changes to a different version, the Department can prevent others from performing analysis on the wrong data. The Public Works Department is not using ArcSDE, since it lacks ArcSDE.

A fifth best practice is the use of geoprocessing models and scripts. Within the GIS applications used by the Public Works Department, if there are common data editing or manipulation functions that occur on a regular basis, it is worth the effort to automate these tasks with geoprocessing. These geoprocessing models and scripts easily turn data manipulation and editing tasks into repeatable tasks and combine functions, which can be scheduled to execute in a batch mode. The Department can preset values to reduce the likelihood of incorrectly entering information and to more efficiently extract data. Geoprocessing models and scripts ensure that functions are executed successfully and in the same order. For example, ESRI has developed a

geoprocessing model and script called Water Utility Network Editing and Analysis that enables GIS Technicians to edit and analyze water network datasets. Other geoprocessing models and scripts include:

- LeakLogger that provides tools to plan the placement of leak listening devices, manage information reported by the devices, and be notified when a leak is reported;
- Hydrant maintenance inspection that enables utilities to use a smartphone or tablet to perform fire hydrant inspections;
- Valve exercising that enables utilities to capture valve exercising data on a smartphone or tablet;
- Water SCADA processor that shares near real time and historical SCADA readings via an interactive map; and
- Main break notification that provides real time notifications and alerts of main breaks.

The Public Works Department has developed some scripts, but does not fully utilize this capacity.

A sixth best practice is the use of the Infrastructure Network Editing template. The Infrastructure Network Editing template is an editing map and toolbar for managing water, wastewater, and stormwater utility data. The Infrastructure Editing toolbar contains a series of custom editing and reporting tools that enrich the editing experience for utilities working with infrastructure data. For example, there are tools for the following tasks:

- Automatically connect service connections to laterals and their mains;
- Report tracing results along the utility network; and
- Graph the profile of a main.

The template also includes an editor extension called Attribute Assistant. This extension uses a series of predefined methods to automatically populate attributes when you update and/or add new features to the geodatabase. The Public Works Department is not using Infrastructure Network Editing template.

A seventh best practice is the use of the ArcGIS Data Reviewer. The ArcGIS Data Reviewer is an extension to ArcGIS Desktop provides easily configurable, out-of-the-box data checks to automate your quality control process. Over 40 automated data checks can be run ad hoc or as a group in a batch job. The Public Works Department is not using the ArcGIS Data Reviewer.

Overall, the Public Works Department is not effectively using some of the ESRI out-of-the box tools to ease the development of a geodatabase and to ensure that the asset data in the GIS is accurate positionally (in the right place), descriptively (describes the asset appropriately), and temporally (up-to-date).

Recommendation #105: The Information Technology Department should use ESRI data models in the design of the water supply and distribution geodatabase to simplify the process of implementing projects and to help promote industry standards to ArcGIS users on behalf of the Public Works Department.

Recommendation #106: The Information Technology Department should use ESRI geometric networks for the water supply and distribution geodatabase, a set of connected edges (lines) and junctions (points), along with connectivity rules to represent and model a common network infrastructure on behalf of the Public Works Department.

Recommendation #107: The Information Technology Department should use the ESRI ArcGIS Workflow Manager for the water supply and distribution geodatabase on behalf of the Public Works Department.

Recommendation #108: The Information Technology Department should acquire and use an ArcSDE geodatabase on behalf of the Public Works Department.

Recommendation #109: The Information Technology Department should increase and enhance the use of geoprocessing models and scripts on behalf of the Public Works Department.

Recommendation #110: The Information Technology Department should use the Infrastructure Network Editing template on behalf of the Public Works Department.

Recommendation #111: The Information Technology Department should use the ArcGIS Data Reviewer on behalf of the Public Works Department.

12. ANALYSIS OF WATER RESOURCES

This chapter presents an analysis of water resource planning by the Water Supply and Distribution Program. The City has made a significant financial commitment to the development of an independent source of supply.

1. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD REPORT ITS PROGRESS IN COMPLETING THE RECOMMENDATIONS IN THE WATER ENTERPRISE PLAN TO THE PUBLIC WORKS COMMISSION ON AN ANNUAL BASIS.

The City retained Psomas to complete the Water Enterprise Plan. This plan was completed in July 2015. The plan made a number of recommendations including the following:

- Optimizing the current Hollywood basin production;
- Develop new Central Basin wells;
- Increase water conservation;
- Develop a water banking capacity;
- Add a Water Resources Manager position;
- Add a Water Conservation Administrator position; and
- Add three Project Managers, three Water Treatment Plant Operators, one Pump / Well mechanic, one Pump / Well Electrician, and one Water Distribution Operator position over the next several years as the need arises.

The 10-year escalated costs of implementing these recommendations are significant. Groundwater development of the La Brea sub-basin was projected to cost \$37.9 million. Water banking was projected to cost \$5.0 million. Water conservation was projected to cost \$2.1 million. Staffing was projected to cost \$16.9 million.

The City has made progress on some of these recommendations. The City has added a Resources Manager position and a Water Conservation Administrator position.

The Water Supply and Distribution Program should report its progress in accomplishing the recommendations contained in the Water Enterprise Plan to the Public Works Commission on an annual basis.

Recommendation #112: The Water Supply and Distribution Program should report its progress in accomplishing the recommendations contained in the Water Enterprise Plan to the Public Works Commission on an annual basis.

2. THE CIVIL ENGINEER POSITION IN THE BUILDING AND SAFETY DIVISION SHOULD CONTINUE TO BE UTILIZED FOR ENGINEERING DEVELOPMENT REVIEW.

The Water Resources Manager within the Public Works Department is charged with the implementation of the Water Enterprise Plan. Yet the Water Resource manager allocates an estimated 50% of his available work hours to engineering development review on behalf of the Water Supply and Distribution Program. This includes the will serve analysis, the review of entitlement applications as it pertains the impact of the proposed development on the water infrastructure, (e.g., water connections and water service requirements, sizing of water meters, fire hydrant requirements, backflow prevention devices, etc.) and answering questions from developers, etc.

The Water Resources Manager is not being provided with the opportunity to review ministerial plans for compliance with water utility standard specifications.

The Building and Safety Division is authorized a Civil Engineer position. That position should continue to be assigned responsibility for development review on behalf of the Public Works Department to ensure adherence to the standard specifications of the Public Works Department and that the infrastructure and systems are capable of supporting the proposed development. The Civil Engineer should be expected to fulfill the following responsibilities on behalf of the Public Works Department:

- Meet with developer or engineer upon request to answer questions, discuss conditions of approval, discuss corrections, etc.;
- Participate in inter-departmental entitlement review meetings with the Planning Division;
- Provide connection options and requirements;
- Review and comment on entitlement and ministerial applications as it pertains to proposed public utilities (water, sanitary sewer and storm sewer); Sidewalks and street lights; public right-of-way access and/or modification to public streets, and utility system capacities and impacts related to development proposals, etc.;
- Provide a will serve availability letter, if necessary;
- Model projected fire flows for the Beverly Hills Fire Department;
- Review, accept and record any required easements; and
- Plan check and approve water and wastewater construction drawings and utility service plans.

This position is presently budgeted in the Building and Safety Division, Community Development Department. The position should function in the same manner as the GIS Integrator and the Systems Integrator positions in the City, which are budgeted in the Information Technology Department, but assigned to work directly with operating departments such as the Public Works Department. In this instance, the Civil Engineer should be budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.

The Water Resources Manager should not be assigned any development review workload on an ongoing basis; this workload should be borne by the Civil Engineer budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.

Recommendation #113: The Civil Engineer position in the Building and Safety Division should continue to be assigned responsibility for development review on behalf of the Public Works Department to ensure adherence to the standard specifications of the Public Works Department and that the infrastructure and systems are capable of supporting the proposed development.

Recommendation #114: The Civil Engineer position in the Building and Safety Division should function in the same manner as the GIS Integrator and the Systems Integrator positions in the City, which are budgeted in the Information Technology Department, but assigned to work directly with operating departments. In the instance of the Civil Engineer, the Civil Engineer should be budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.

Recommendation #115: The Water Resources Manager should not be assigned any development review workload on an ongoing basis; this workload should be borne by the Civil Engineer budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.

3. THE TWO PROJECT MANAGERS BUDGETED IN THE ENGINEERING DIVISION SHOULD BE ASSIGNED TO WATER SUPPLY AND DISTRIBUTION CAPITAL PROJECTS ON A FULL-TIME BASIS.

The Water Supply and Distribution Program has budgeted two Project Managers. Those two positions, while budgeted in that Program, actually work for the Engineering Division under the supervision of the City Engineer. These two positions were established largely in response to the Water Enterprise Plan. There are a number of sizable projects in the Water Enterprise Plan including groundwater development of the La Brea sub-basin at a projected cost \$37.9 million, and water banking at a projected cost of \$5.0 million. There are other capital projects funded in FY 16-17 by the Water Supply and Distribution Program including reservoir replacement and pump station rehabilitation (\$1.6 million), water main and hydrant replacement (\$2.0 million), and non-potable water project (\$2.2 million).

These two positions, although budgeted full-time in the Water Supply and Distribution Program, do not work full-time to execute capital projects funded by that Program. These two positions work on a multiple number of projects funded by sources other than the Program.

The result has been that the Water Resources Manager has had to shoulder responsibility for managing consulting engineers and Water Enterprise Plan capital projects.

Given the capital project workload associated with the Water Supply and Distribution Program, including the implementation of the Water Enterprise Plan, these two positions should be assigned to Water Supply and Distribution Program capital projects on a full-time basis.

Recommendation #116: Given the capital project workload associated with the Water Supply and Distribution Program, including the implementation of the Water Enterprise Plan, the two Project Managers positions in the Engineering Division funded by the Water Enterprise Fund should be assigned to Water Supply and Distribution Program capital projects on a full-time basis.

13. ANALYSIS OF UTILITY BILLING

This chapter presents an analysis of utility billing, as managed by the City's Administrative Services Department.

1. THE CITY SHOULD BILL ITS WATER CUSTOMERS ON A MONTHLY BASIS.

The City of Beverly Hills bills its water customers on a bi-monthly basis. This is an becoming a more and more unusual practice.

A survey by the American Water Works Association – California – Nevada Section in 2013 found that 61% of the respondents have converted to monthly billing.

This practice goes along with the overall industry trend especially as more agencies use automated meter reading technologies. Monthly billing is becoming a prevailing practice, as monthly billing helps convey information on consumption and pricing to the customer more quickly. As rates increase and bills get larger, customers find it easier to pay smaller monthly bills than larger bi-monthly bills. Monthly billing also reduces the problems with bad debt since accounts receivables are less with a monthly billing process versus a bi-monthly billing process.

The American Water Works Association – California – Nevada Section found that the trend in conversion to monthly billing was increasing and the use of bi-monthly billing decreasing.

Recommendation #117: The Administrative Services Department should develop a proposal for the consideration of the City Council regarding the costs and benefits of the conversion of water utility billing from bi-monthly billing to monthly billing.

2. THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD MODIFY A NUMBER OF ITS UTILITY BILLING PRACTICES.

The Administrative Services Department budgeted bad debt reserves for water utility billing in the amount of 1.49% of revenues for fiscal year 2014-15. This is unusually high, even for communities with a different economic profile for their customers. The % bad debt write-off for the City of Palo Alto is substantially lower, for example.

This may be, in part, due to bi-monthly billing since a larger amount of revenue is outstanding with a bi-monthly billing system.

It is also due to slack in the utility billing system. While the Administrative Services Department issues bills after meters are read within metrics (within 3 calendar days of the meter being read), and send reminder notices within 30 calendar days of the initial bill being mailed, the Administrative Services Department issues a final notice that the City will initiate shut off at 60 calendar days after the initial bill was mailed (versus the metric of 36 calendar days), and will suspend service at 70 calendar days of the initial bill being mailed (versus the metric of 45 calendar days).

In addition, the Administrative Services Department only charges 1.5% per month as a late penalty fee for residential accounts and 3% for commercial. The metric is 2% to 5%.

The Administrative Services Department should modify its utility billing practices. It should mail the final notice that the City will initiate shut off at 36 calendar days after the initial bill was mailed and the notice to suspend service at 45 calendar days after the initial bill being mailed. In addition, it should increase the % cost for late payments to 2% per month.

Recommendation #118: The Administrative Services Department should mail the final notice that the City will initiate shut off at 36 calendar days after the initial bill was mailed and the notice to suspend service at 45 calendar days after the initial bill being mailed.

Recommendation #119: The Administrative Services Department should increase the % cost for late payments to 2% per month.

3. THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD TAKE STEPS TO EASE THE ABILITY OF WATER UTILITY CUSTOMERS TO PAY THEIR BILLS ELECTRONICALLY.

NACHA, the electronic billing association, noted in a 2011 e-billing benchmark study that many traditional, paper-based billers, including the financial services and telecommunications industries, are seeing paperless billing adoption rates of well over 30%.

The City of Beverly Hills is experiencing an adoption rate of electronic payments of 15.1% of the total payments by number, and 13.5% by dollar amount for the water utility.

The Administrative Services Department should take a number of steps to ease the ability of water utility customers to pay their bills electronically. This should begin with the acquisition of a commercial-off-the-shelf web interface so that customers can pay quickly.

In addition, the web interface should enable customers to pay without registering. A study of 24 utilities in 2011 identified customer preferences in this regard. When presented with registration and non-registration payment options, 62% of customers will opt to make a quick payment (without registering a password). This suggests that customers are (1) often in a hurry and don't want to spend the time registering; and (2) want to avoid the hassle of managing another password.

The web interface should provide customer notifications (e.g., notice that their payment is about to be late). According to the 2011 study, 52% of customers want to receive notifications from their utility when a bill is due to help avoid a late or missed payment. The same study indicated that over 50% of consumers would be interested in a text, email, or voicemail alert to remind them when a bill is due. Providing for such notifications would reassure customers that they won't inadvertently miss a bill and/or payment.

The web interface should provide multiple payment methods (cash, check, credit card, ACH, direct debit) for customers. According to the 2011 study, many customers change the way they pay their bill each month. A customer may pay their bill by credit card one month and by debit card or ACH the next, with nearly two out of three saying that funds availability is the reason for doing so. Customers want to avoid making a late payment and their circumstances are continuously changing.

The web interface should keep convenience fees to a minimum. Convenience fees are charged to the customer for electronic transactions made by credit card or ACH. A study in 2011 identified a direct correlation between the convenience fee amount and the adoption rate of electronic payments. Too high and adoption rates will drop. A municipal electric utility in Texas eliminated its policy of charging a \$4.95 convenience fee for web payments. Within six months, the number of web payments increased from 18% of total payments to almost 30%.

The Administrative Services Department should acquire a web interface commercial off the shelf software to enable electronic billing, payment, and communication with utility customers.

Recommendation #120: The Administrative Services Department should acquire web interface commercial off the shelf software to enable electronic billing, payment, and communication with utility customers.

4. THE WATER SUPPLY AND DISTRIBUTION PROGRAM AND THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD DEVELOP AND IMPLEMENT A POLICY AND PROCEDURE TO RECONCILE THE WATER METER DATA IN ACLARA AND IN MUNIS ON A REGULAR AND ONGOING BASIS.

One of the goals of the acquisition of the acquisition and installation of the Advanced Metering Infrastructure was to increase meter reading accuracy and reduce the number of meter re-reads due to inaccurate reads.

This goal has not been effectively achieved. Re-reads have typically amounted to 5% to 10% of meters in a billing cycle (although this has recently decreased to 1.5% to 5%).

The metric used by the Matrix Consulting Group for meter reading accuracy is 99.9% accuracy, particularly for the Advanced Metering Infrastructure utilized by the City of Beverly Hills.

The current variation in the City indicates that the Water Supply and Distribution Program and the Administrative Services Department should work together to reduce the extent of meter re-reads. These steps should involve the ongoing and proactive reconciliation of meter account data within Aclara to the meter account data within the utility billing system in Munis. Before each billing cycle, the Field Services Representative should compare the meter account data in Aclara to the meter account data in Munis, identify discrepancies, collect the meter account data in the field to resolve the discrepancies, and enter the correct meter account data in Aclara or Munis.

This process should be clarified in a formal written policy and procedure developed by the Water Supply and Distribution Program and the Administrative Services Department.

Recommendation #121: The Water Supply and Distribution Program and the Administrative Services Department should work together to reduce the extent of meter re-reads. This should include the ongoing and proactive reconciliation of meter account data for each billing cycle within Aclara to the meter account data within the utility billing system in Munis. Before each billing cycle, the Field Services Representative should compare the meter account data in Aclara to the meter account data in Munis, identify discrepancies, collect the meter account data in the field to resolve the discrepancies, and enter the correct meter account data in Aclara or Munis.

Recommendation #122: The process to provide proactive reconciliation of meter account data within Aclara to the meter account data within the utility billing system in Munis should be clarified in a formal written policy and procedure developed by the Water Supply and Distribution Program and the Administrative Services Department.

5. THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD BE PROVIDED WITH ACCESS TO THE HANSEN COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

The interface between the utility billing unit within the Administrative Services Department and the Water Supply and Distribution Program is essential in requesting meter re-reads, the repairs or replacement of stuck meters, etc.

When the Public Works Department proceeds forward with the re-optimization of the Hansen computerized maintenance management system within the Water Supply and Distribution Program, the utility billing unit in the Administrative Services Department should be provided with access so that unit can issue work orders on-line to the Program to requesting meter re-reads, the repairs or replacement of stuck meters, etc. This will ease communication between the Water Supply and Distribution Program

and the Administrative Services Department and better enable supervisors in the Program to manage response time to these work order requests.

Recommendation #123: When the Public Works Department proceeds forward with the re-optimization of the Hansen computerized maintenance management system within the Water Supply and Distribution Program, the utility billing unit in the Administrative Services Department should be provided with access so that unit can issue work orders on-line to the Program to request meter re-reads, the repairs or replacement of stuck meters, etc.

6. THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD WORK WITH THE WATER SUPPLY AND DISTRIBUTION PROGRAM TO ENSURE PROPER COVERAGE OF THE STAR NETWORK DATA COLLECTOR UNITS IN THE CITY.

The STAR Network Data Collector Unit is the backbone of an AMI network, communicating to meter transmission units (MTU's) over radio frequencies, and to the STAR Network Control Computer (NCC) using a network backhaul of choice.

The Administrative Services Department expressed concern regarding the adequacy of the coverage of the Data Collector Units in Beverly Hills.

The Administrative Services Department and the Water Supply and Distribution Program should work together to assess the coverage of the Data Collector Units in Beverly Hills, and whether additional units should be installed to reduce coverage gaps, the risks of failure from one specific Data Collector Unit, etc.

Recommendation #124: The Administrative Services Department and the Water Supply and Distribution Program should work together to assess the coverage of the Data Collector Units in Beverly Hills, and whether additional units should be installed to reduce coverage gaps, the risks of failure from one specific Data Collector Unit, etc.

7. THE WATER SUPPLY AND DISTRIBUTION PROGRAM AND THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD DEVELOP A PLAN FOR THE REPLACEMENT OF METER TRANSMISSION UNITS.

The City has been replacing the meter transmission units due to their battery failure. This failure occurred unexpectedly, and the City had not developed any operations plans for the replacement of these units on a system-wide basis.

The planning for system-wide replacement of these units needs to consider a number of factors. How much time does Beverly Hills have before the units began fail all at once again, causing a major disruption to the utility billing? Will the failures of the units occur gradually enough that the City could replace them using in-house staff, or would they be forced to conduct a full-blown replacement program using outside contractors? Should the City continue with the same automatic meter reading infrastructure or is there a better choice? Should the water meters be replaced at the same time as the units? If the work was performed contractually, should the City utilize a single prime contractor or utilize multiple contracts whereby the City purchases the meter transmission units, and then competitively bids out the installation work

An overall operations plan, schedule, budgetary cost estimates and funding mechanisms will be needed.

The Administrative Services Department and the Water Supply and Distribution Program should work together to develop a written operational plan for the system-wide replacement of the meter transmission units.

Recommendation #125: The Administrative Services Department and the Water Supply and Distribution Program should work together to develop a written operational plan for the system-wide replacement of the meter transmission units.

8. THE ADMINISTRATIVE SERVICES DEPARTMENT SHOULD DEVELOP AND REPORT PERFORMANCE AGAINST METRICS FOR THE UTILITY BILLING CALL CENTER.

There are a number of essential metrics used by call centers to measure the responsiveness of the service provided to customers. These include such metrics as the % of calls answered within 20 seconds, within 30 seconds, and within 60 seconds; the % of calls abandoned; etc.

The Administrative Services Department is unable, at this time, to provide data regarding these metrics.

The Administrative Services Department should develop the capacity to collect and to report these essential measures of customer service for the City's utility call center.

Recommendation #126: The Administrative Services Department should develop the capacity to collect and to report metrics of customer service for the City's utility call center such as % of calls answered within 20 seconds, within 30 seconds, and within 60 seconds; the % of calls abandoned; etc.

14. ANALYSIS OF EMERGENCY PLANNING

This chapter presents an analysis of emergency planning by the Water Supply and Distribution Program.

1. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD PREPARE BUSINESS CONTINUITY POLICIES AND PROCEDURES, AND TRAIN ITS MANAGERS, SUPERVISORS, AND STAFF IN THEIR APPLICATION.

The City of Beverly Hills does conduct annual emergency plan exercises that includes the Water Supply and Distribution Program. In addition, the Water Supply and Distribution Program has prepared a draft *Water Main Emergency Action Plan*.

However, the Water Supply and Distribution Program has not developed a training plan for the *Water Main Emergency Action Plan* nor begun training its staff.

The Water Supply and Distribution Program, upon adoption of the draft *Water Main Emergency Action Plan*, should train its staff in the plan and conduct annual exercises to enable staff to practice the plan.

Recommendation #127: The Water Supply and Distribution Program should finalize its draft *Water Main Emergency Action Plan*.

Recommendation #128: The Water Supply and Distribution Program, upon finalizing the draft *Water Main Emergency Action Plan*, should train its staff on an annual ongoing basis in the plan and conduct exercises to enable staff to practice the plan.

15. ANALYSIS OF ADMINISTRATION

This chapter presents an analysis of the administration of the Water Supply and Distribution Program including training of the staff of the Program; strategic planning; and goals, objectives, and performance measures.

1. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD DEVELOP A STRATEGIC PLAN.

The City of Beverly Hills has developed a vision statement for the City. That vision statement is presented below.

- Offer the highest quality of life achievable and maintains a unique and friendly character for residents, visitors, and neighbors.
- Be a world-class community, offering an extraordinary environment, activities, and events.
- Be known throughout the region, state and nation as a leading edge, innovative community in its government, business, and technology programs.
- Be committed to being the safest city in America.
- Be known internationally for its alluring and distinctive hotels, retail stores, restaurants, and entertainment and headquarter businesses.

In addition, the City Council developed a number of priorities for fiscal year 2016-17, many of which pertain to the Water Supply and Distribution Program. Those priorities pertaining to the Water Supply and Distribution Program are presented below.

- **La Cienega Regional Treatment Facility.** Work with the cities of Los Angeles and West Hollywood to develop and build a regional stormwater facility for the 3 cities, identified in the Enhanced Watershed Management Plan.
- **Water Enterprise Plan.** Implement the plan, which includes short, mid and long-range plans for the City's water system which will need to be implemented to ensure continued system reliability.
- **Reservoir Reconstruction and Water Storage Capacity.** Evaluate current emergency storage and identify projects to increase water storage capacity

- **Coldwater / Cabrillo Reservoirs.** Redevelop decommissioned reservoir site for storage of Potable and Non-Potable water and evaluate purple pipe distribution system
- **Comprehensive Financial Review of the Water Enterprise Fund.** Conduct review of expenses and revenues of the Water Enterprise Fund to evaluate cost effectiveness. Expand on water rate structure analysis to evaluate water system operating costs.
- **Water Conservation Program.** Continue to implement the City's water conservation program.
- **Urban Water Management Plan.** Complete five-year Urban Water Management Plan, as required by the State Department of Water Resources.
- **Separate Landscape Metering.** Require and finance the installation of a separate landscape meter for all existing properties.

Some of these priorities will be implemented in the short-term. Others, however, will require a number of years to implement, such as the Water Enterprise Plan.

This is the function of a strategic plan: to set overall goals and develop a plan to achieve them. It involves stepping back from the day-to-day business of the Water Supply and Distribution Program and thinking about where the Program is headed, changes needed, and the priorities of those changes.

The Water Supply and Distribution Program should develop a strategic plan. The development of this strategic plan should consider the WERF publication "A Strategic Assessment of the Future of Water Utilities" and the publication "Effective Utility Management - A Primer for Water and Wastewater Utilities." The development of a strategic plan by the Water Supply and Distribution Program should consider the long-term financial plan for the water utility, the capital improvement program for the City, preventive and predictive maintenance, water supply, water conservation, asset

management, water system standard specifications for capital projects and private development, technology, customer service, etc.

A number of other utilities have already developed strategic plans including Lees Summit, Missouri; Raleigh, North Carolina; East Bay Municipal Utilities District, California; City of San Diego, California; Oceanside, California; Palo Alto, California; etc.

Management Practice 1.6 within the *American Public Works Association's Public Works Management Practices Manual* states as a best practice that "the agency has developed and implemented a strategic plan." The strategic plan should include levels of service, planning goals and objectives, plan monitoring, plan documentation, goals and objectives, trends in water utilities and how the Program should respond to those trends (e.g., increased challenges in the adequacy of water supply), etc.²²

The best practices regarding development of a strategic plan that should be utilized by the Water Supply and Distribution Program are presented in the table below.

The Water Supply and Distribution Program has a multi-year strategic plan with annual goals and measurable objectives based on identified needs, projected workload, and expenditures and revenues.
The Water Supply and Distribution Program maintains and publishes a clearly written, multi-year (five years at a minimum) strategic plan to provide vision and direction for the Water Supply and Distribution Program. The plan links City and Water Supply and Distribution Program goals.
In developing the strategic plan, the Water Supply and Distribution Program: <ul style="list-style-type: none">• Identifies and formally adopts a limited number (5 to 10) of Water Supply and Distribution Program priorities to guide its strategies and major financial and program decisions;• Considers the impacts of the City's financial condition, five-year capital program, current expenditures by the Water Supply and Distribution Program, and opportunities to reallocate staff and other resources to enhance performance; and• Instructs Water Supply and Distribution Program management and supervisors on how these priorities should be considered in making program and budget decisions.

²² American Public Works Association, Management Practices Manual, 2004.

The Water Supply and Distribution Program has a multi-year strategic plan with annual goals and measurable objectives based on identified needs, projected workload, and expenditures and revenues.
The strategic plan clearly delineates the Water Supply and Distribution Program goals, and objectives and strategies for achieving them. In developing these strategies, Water Supply and Distribution Program considers alternative service delivery systems such as outsourcing.
The plan also delineates the priorities the City's strategic plan in developing its goals, objectives, and strategies.
The objectives in the strategic plan are measurable, and the Water Supply and Distribution Program has set annual objectives for each goal for at least five years into the future.
The Water Supply and Distribution Program goals, objectives, and performance measures are based on past performance, identified needs, projected workload, and expenditures and revenues.
The plan delineates the managers and supervisors responsible for implementing the strategies in the plan and the time frames for implementation.
The Assistant Director for Infrastructure and Field Operations annually assesses and reports the progress the Water Supply and Distribution Program has made toward achieving the goals and objectives in the plan.

In updating the strategic plan for the division, the Water Supply and Distribution Program should identify its:

- Strengths (e.g., the redundancy in water supply);
- Weaknesses (asset management);
- Threats (e.g., aging workforce); and
- Opportunities (e.g., increased use of technology);

The Water Supply and Distribution Program should define its updated goals and objectives, and the strategies it will utilize to achieve the goals and objectives. The Water Supply and Distribution Program should develop metrics to assess its success in accomplishing the strategic plan. And then the Water Supply and Distribution Program should define the managerial responsibilities for accomplishing those goals, objectives and strategies.

The following table shows the relationship between each of these elements in the development of the updated strategic plan.

	Strategic Plan	Goals	Objectives	Measures
Purpose	Overall multi-year vision of organizational goals.	Multiple elements that will holistically achieve vision.	Actual deliverables with established goals.	Quantifiable metrics that demonstrate movement towards objectives.
Time Window	5-year scope; updated annually.	Updated annually.	Updated annually.	Monitored quarterly.
Example	Provide safe, reliable water at a cost effective rate	Ensure compliance with applicable state and federal regulations for potable water.	Complete the installation of the SCADA system by June 30, 2017 to reduce risk and cost through technology and automation	Maintain a ratio of not less than 80% planned / scheduled labor hours to 20% reactive and unscheduled labor hours

Recommendation #129: The Water Supply and Distribution Program should develop a strategic plan to include goals, objectives, and metrics to measure the successful implementation of the strategic plan.

2. THE WATER SUPPLY AND DISTRIBUTION PROGRAM SHOULD DEVELOP GOALS, OBJECTIVES, AND PERFORMANCE MEASURES.

The Water Supply and Distribution Program should develop goals, objectives, and performance measures. These objectives and metrics should be updated annually, and previous years' performance be reported, as part of Water Supply and Distribution Program' budget proposal each year.

Goals and objectives should be developed for each functional area (water distribution, water pumping, water storage, water supply). Performance measures should then be developed to assess the accomplishment of these objectives.

The development of goals, objectives and performance measures for each functional area should consider the guidelines presented below.

- **Goals should be developed for each functional area.** These goals should give specific direction on how each function will contribute to the mission and goals of the Program. These goals should not be quantifiable. These goals should span multiple years.
- **Objectives should be developed for each functional area.** Objectives are outcome-based statements of what specifically will be achieved within the fiscal year. Each functional area should have 3 to 5 objectives. The objectives should clearly demonstrate progress toward the goals of the functional area. These objectives should be developed to allow for measurement of progress and be quantifiable.
- **Performance measures should be developed for each objective.** Performance measures should convey the extent to which an objective has been met. These measures should include a range of indicators including input, 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 overtime. An efficiency measure is the inputs used per unit of output, such as the valves exercised per crew day. A service quality measure could be the results of the Consumer Confidence Report. An outcome measure is the qualitative consequences associated with a program or service - the ultimate benefit to a customer. An example would be a satisfaction rates of customers with the Water Supply and Distribution Program.
- **The Water Supply and Distribution Program should communicate and use performance measurement data for decision-making and accountability reporting.** The Deputy Director for Infrastructure and Field Operations should involve the management and supervisory team of the Water Supply and Distribution Program in the development of goals, objectives, and performance measures. The Deputy Director for Infrastructure and Field Operations should communicate the results of these goals, objectives, and performance measures internally to staff and to customers using a Dashboard on not less than a quarterly basis.

The development of goals, objectives, and performance measures are a key aspect of transparency and managerial and supervisory accountability.

Recommendation #130: The Water Supply and Distribution Program should develop goals, objectives, and performance measures for each functional area within the Division.

16. ANALYSIS OF REAL PROPERTY

The Water Supply and Distribution Program has purchased and owns, via the Water Enterprise Fund, a number of properties in Beverly Hills and in West Hollywood. The City has recognized the underutilization of some of the property owned by the Water Supply and Distribution Program. In February 2016, the City Council approved the payment of \$1.5 million annually from the General Fund to the Water Enterprise Fund for two properties – the West Hollywood pipe yard and the La Cienaga Boulevard property that are either underutilized or being leased to outside tenants at less than market rates, based on past Council direction.

1. THE WATER ENTERPRISE FUND “OWNS” A NUMBER OF PROPERTIES IN BEVERLY HILLS AND WEST HOLLYWOOD.

The exhibit following this page presents a list of property “owned” by the Water Enterprise Fund. As the exhibit notes, the Water Enterprise Fund “owns” seventeen different pieces of real estate in West Hollywood and Beverly Hills. These seventeen pieces of real estate consist largely of property that contains water storage tanks / reservoirs and pump stations.

In some instances, while the Water Enterprise Fund funded the construction of a water storage tank or reservoir, the facility was apparently built on property purchased by the General Fund (e.g., Coldwater Park).

2. THE PUBLIC WORKS DEPARTMENT SHOULD CONDUCT A MARKET-BASED RENTAL ANALYSIS OF THE RENT RECEIVED BY THE WATER ENTERPRISE FUND FOR PROPERTIES USED BY THE GENERAL FUND.

There are three properties “owned” by the Water Enterprise Fund that receive rent from the General Fund; These include:

- The Public Works facility at 345 North Rexford;

Property “Owned” by the Water Enterprise Fund

Property	Address
Reservoir #7	405 Walker Dr.
Reservoir #6	1020 Loma Vista Dr.
Reservoir #5	405 Trousdale Dr.
Reservoir #4b	1100 Loma Vista Dr.
Greystone Pump Station	905 Loma Vista Dr.
Booster Station #2	1045 Woodland Dr.
Booster Station # 48	9400 Roadcrest Dr.
Reservoir 3b Cabrillo	0 Cabrillo Dr.
Reservoir 3a Loma Linda	1137 Loma Linda Dr.
Coldwater Reservoir	0 Woodland Dr.
Green Acres Pump Station	1100 Benedict Cny.
Sunset Reservoir	0 Sunset Blvd.
Sunset Fluoride Station	0 Sunset Blvd.
Metro Pipe Connections	0 Sunset Blvd.
West Hollywood Pipe Yard	621 N. Robertson Blvd.
Public Works Facility	345 N. Foothill Dr.
Motion Picture Academy	333 South La Cienega

- The La Cienega Boulevard facility at 333 South La Cienega; and
- The West Hollywood pipe yard at 621 North Robertson.

The rent received by the Water Enterprise Fund from the General Fund for the use of these property or to compensate for the underutilization of this property was not based upon a market-based rent analysis of the highest and best use of these properties. For example, the rent received by the Water Enterprise Fund for the Motion Picture Academy at 333 South La Cienega Boulevard was based upon a “guess that we could rent the building in a range from \$3 - \$5 / SF” provided by the former Real Property Manager. The actual rent was set at the low end of the range: at \$3 per square foot. The rent for the West Hollywood pipe yard was based upon an estimate provided by the Assistant Director of Public Works, Facility Operations, based upon the potential parking revenue that could be received.

The Public Works Department should assign responsibility to its Assistant Property Manager position, once filled, to conduct a market-based rent analysis of these three properties - 333 South La Cienega Boulevard, the West Hollywood pipe yard, and the Public Works facility at 345 North Rexford - and develop recommendations regarding the rent that should be paid by the General Fund to the Water Enterprise Fund for these three properties that reflects their market-based rent, given the current conditions of the property. At the same point in time, the Assistant Property Manager position should also be assigned responsibility for developing recommendations regarding the appropriate market-based rent that should be provided by the Water Enterprise Fund to the General Fund for properties “owned” by the General Fund, but used by the Water Enterprise Fund for water storage tanks.

Recommendation #131: The Public Works Department should assign responsibility to its Assistant Property Manager position, once filled, to conduct a market-based rent analysis of these three properties - 333 South La Cienega Boulevard, the West Hollywood pipe yard, and the Public Works facility at 345 North Rexford - and develop recommendations regarding the rent that should be paid by the General Fund to the Water Enterprise Fund for these three properties that reflects their market-based rent, given the current conditions of the property.

Recommendation #132: The Assistant Property Manager position should also be assigned responsibility for developing recommendations regarding the appropriate market-based rent that should be provided by the Water Enterprise Fund to the General Fund for properties “owned” by the General Fund, but used by the Water Enterprise Fund for water storage tanks.

17. ANALYSIS OF THE PLAN OF ORGANIZATION

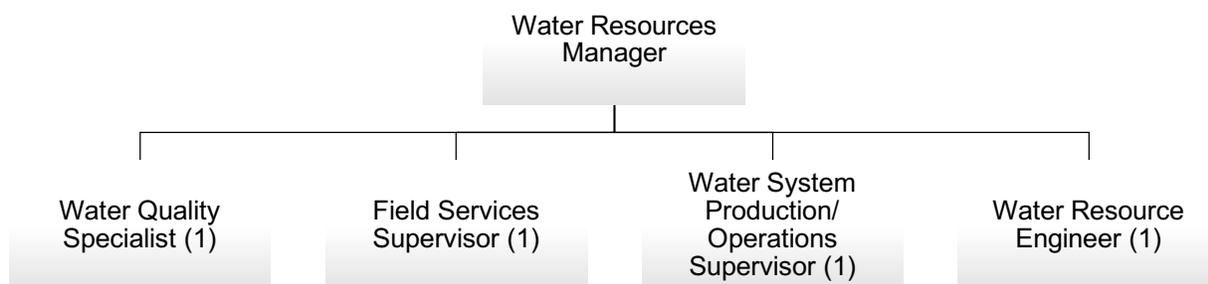
This chapter presents an analysis of the plan of organization of the Water Supply and Distribution Program.

- 1. UPON THE RETIREMENT OF THE WATER OPERATIONS MANAGER, THE WATER RESOURCE MANAGER SHOULD BE ASSIGNED RESPONSIBILITY FOR THE MANAGEMENT OF THE WATER SUPPLY AND DISTRIBUTION PROGRAM.**

At the present time, there are two middle managers for the Water Supply and Distribution Program. One of these positions, the Water Operations Manager, manages the Water Supply and Distribution Program. The other position, the Water Resources manager, manages the implementation of the Water Enterprise Plan.

Two middle managers are unnecessary. Upon the retirement of the Water Operations Manager, the Water Resources Manager should be assigned responsibility for managing the Water Supply and Distribution Program. The vacant Water Operations Manager should be reclassified within the civil engineering series and the position, under the supervision of the Water Resources manager, utilized to coordinate the implementation of the Water Enterprise Plan.

The proposed plan of organization is presented below.



The proposed plan of organization provides a reasonable span of control, and provides continuity for the implementation of the Water Enterprise Plan.

Recommendation #133: Upon the retirement of the Water Operations Manager, the Water Resources Manager position should be assigned responsibility for managing the Water Supply and Distribution Program.

Recommendation #134: The vacant Water Operations Manager position should be reclassified within the civil engineering series and, under the supervision of the Water Resources Manager position, utilized to coordinate the implementation of the Water Enterprise Plan.

2. THE CIVIL ENGINEERING GIS SPECIALIST SHOULD BE TRANSFERRED FROM THE PUBLIC WORKS DEPARTMENT TO THE INFORMATION TECHNOLOGY DEPARTMENT.

There are a number of alternatives to the organization of GIS services delivery.

The first alternative is centralized GIS service delivery. A centralized GIS organizational structure delivers GIS services throughout the City with one department that is responsible for all GIS services. In this type of structure, GIS often has its own dedicated division within an Information Technology Department. The GIS division will employ managers, coordinators, and technicians tasked with hardware, software, application development, planning, and training. Data are created and maintained by this group, or outsourced to contractors. All other participants are characterized as end-users, with only the capability to view, query, and analyze spatial data.

The second alternative is decentralized GIS service delivery. A decentralized organizational structure divides GIS responsibilities throughout various departments. Decentralized organizational structures may still have a GIS Section, operating within an Information Technology Department. But this approach divides system and data maintenance between the GIS Section, operating within an Information Technology Department, and departmental end-users. During their course of daily business, users update an enterprise database (e.g., using ArcEditor to edit data). All users share responsibility for maintaining the GIS, and users within each department maintain

specific data according to their thematic disciplines and specialties. This type of organizational structure enables the GIS Section within an Information Technology Department to focus on hardware and software maintenance, data exchange and distribution, application/data design and development, user training and support, community extension, and technology innovation, instead of devoting time to the creation and maintenance of data.

The second alternative - decentralized GIS service delivery - in a small organization such the City of Beverly Hills, increases the likelihood of delays in implementation and patchy implementation of GIS throughout the City. Users throughout the City are responsible for updating an enterprise database (e.g., using ArcEditor to edit data). Users within each department maintain specific data according to their thematic disciplines and specialties. Departments within the City lack sufficient staff resources with the requisite expertise to effectively accomplish these GIS responsibilities.

The City of Beverly Hills should utilize centralized GIS service delivery. There are a number of advantages to centralized GIS service delivery. These advantages are portrayed below.

- Rapid resource shifting and workload balancing is made easier.
- Enhanced opportunity to create and sustain a consistent GIS organizational culture and operational philosophy, congruent with those of the executive leadership.
- Increased career advancement and professional development potential within the Information technology structure.
- Opportunities to avoid conflicting and / or incompatible responses to service issues are enhanced.

- Single department accountability for GIS service quality and responsiveness issues.
- Creates a single organizational point of contact for the City's GIS issues and inquiries.
- Sharing of scarce or specialized GIS resources, including staff and equipment, is more easily accommodated within the context of a single set of priorities.
- Combining functions into a single GIS work group will facilitate cooperation, reduce "finger pointing" and create shared ownership of results.
- Fewer GIS handoffs will occur between departments, with like functions being together. Enhanced ability to create, share and use GIS knowledge, especially within the GIS disciplines

This scenario offers several advantages over the current arrangement.

Recommendation #135: The Civil Engineering GIS Specialist should be transferred from the Public Works Department to the Information Technology Department, but continue to be physically based in the Public Works Department administration building.

Attachment 2

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
1	Chapter 1 - Introduction and Executive Summary	The management study of the Water Supply and Distribution Program should be distributed to the relevant departmental directors, managers and supervisors of the City that are involved in the Program for review and input.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
2	Chapter 1 - Introduction and Executive Summary	The Public Works Director, Assistant Public Works Director – Infrastructure and Field Operations, Finance Director, Information technology Director, and City Engineer should review the proposed plan of implementation and the summary of recommendations in this report with these managers and supervisors of the City that are involved in the Program, modify the plan of implementation as appropriate, and submit the revised plan of implementation to the Office of the City Manager.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
3	Chapter 1 - Introduction and Executive Summary	After acceptance of the report and the implementation plan by the Office of the City Manager, a semi-annual status report outlining implementation progress should be provided to the Office of the City Manager by the Assistant Public Works Director – Infrastructure and Field Operations.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
4	Chapter 4 - Analysis of Indirect Cost Allocation	The City should either update its cost allocation plan manual to reflect how costs are being allocated in the cost allocation model, or alter the methodology used in the model to reflect the description currently shown in the manual.	Medium	2017	Director of Administrative Services & Chief Financial Officer
5	Chapter 4 - Analysis of Indirect Cost Allocation	The cost of purchased water should be excluded from the City's budget allocation metrics in the City's cost allocation model. However, before the Administrative Services Department makes this adjustment excluding the cost of purchased water from the City's budget allocation metrics in the City's cost allocation model, the Administrative Services Department should report back to the Office of the City Manager and the City Council regarding the implications of this adjustment to other funds. Clearly, if the allocation of indirect costs is reduced for the Water Enterprise Fund, the allocation of costs will need to be increased for other funds to compensate for that reduction.	High	2017	Director of Administrative Services & Chief Financial Officer

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
6	Chapter 5 - Analysis of Asset Management	The Public Works Department should develop an asset management policy and procedure for the consideration of the Office of the City Manager, Mayor and City Council.	High	2017	Deputy Director of Public Works - Operational Support
7	Chapter 5 - Analysis of Asset Management	In the development of an asset management policy and procedure, the Public Works Department should clarify accountability for the management of each of the assets under its stewardship.	High	2017	Deputy Director of Public Works - Operational Support
8	Chapter 5 - Analysis of Asset Management	The Public Works Department should establish a departmental asset management committee to facilitate a coordinated departmental asset management approach.	High	2017	Deputy Director of Public Works - Operational Support
9	Chapter 5 - Analysis of Asset Management	The Public Works Department should designate the managers within the department that are accountable for managing each specific type of asset assigned to the stewardship of the Department. Each asset manager should be responsible for the development of an asset management strategy and plan for those assets assigned to their management.	High	2017	Deputy Director of Public Works - Operational Support
10	Chapter 5 - Analysis of Asset Management	The City should establish an Asset Management Office within the Public Works Department. The Asset Management Office should be incorporated in the Operational Support Division of the department.	High	2017	Deputy Director of Public Works - Operational Support
11	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should provide a support function to all divisions in the Department providing a clear asset management policy and asset management strategy, common standards (including tools and templates), ensuring consistency in delivery and reporting and ongoing support to departmental asset managers.	High	2017	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
12	Chapter 5 - Analysis of Asset Management	<p>The Asset Management Office, Public Works Department should be expected, initially, to (1) Manage the implementation of GIS in the Public Works Department working with the Information Technology Department; (2) Manage the implementation of the Hansen computerized maintenance management system working with the Information Technology Department; (3) Develop and populate levels of service at the asset level with supporting metrics that provides clear levels of service to guide decision-making (e.g., testing the registration accuracy of commercial meters in accordance with American Water Works Association guidelines); (4) Working with the asset managers in the Public Works Department, develop asset management plans by type of asset to provide guidance for asset management activities, propose the maintenance, repair, and replacement strategies for each type of asset, and document the financial implications of the strategies; (5) Establish a standardized methodology for condition assessments of assets including guidelines and frameworks; (6) Establish asset management procedures and standard guidelines; (7) Develop a comprehensive maintenance management system for the assets assigned to the stewardship of the Public Works Department; (8) Develop and implement asset management reporting strategies and policies.</p>	High	2017	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
13	Chapter 5 - Analysis of Asset Management	Four positions within the Public Works Department should be allocated to the Asset Management Office. These include: (1) the Civil Engineering GIS Specialist and any of the temporary GIS staff resources allocated to GIS within the Public Works Department; (2) the GIS Integrator (this position is budgeted in the Information Technology Department, but the coordination between the Public Works Department and the Information Technology Department should be provided through the Asset Management Office); (3) the Systems Integrator (the overall coordination of the Systems Integrator position would be provided by the Deputy Director of Public Works Services - Operational Support, but the position should work within the Asset Management Office in the implementation of the Hansen computerized maintenance management system and its integration with other information systems such as Munis); (4) the Planning and Research Analyst in Public Works Administration responsible for working with departmental managers, supervisors and the Systems Integrator to implement the Hansen computerized maintenance management system.	High	2017	Deputy Director of Public Works - Operational Support
15	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should coordinate and lead the collection of asset inventory data for each of the assets assigned to the Public Works Department for maintenance and repair.	High	2017	Deputy Director of Public Works - Operational Support
16	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should coordinate the updating of the asset inventory data on an ongoing basis.	High	2017	Deputy Director of Public Works - Operational Support
17	Chapter 5 - Analysis of Asset Management	The responsibility for updating of the asset inventory information should be assigned to each asset manager within the Public Works Department in a written policy and procedure.	High	2017	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
18	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should develop a written departmental policy and procedure regarding the updating of the asset inventory on an ongoing basis.	High	2017	Deputy Director of Public Works - Operational Support
25	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should collect and enter asset data for those assets entrusted to its care into the GIS geodatabase and sync the geodatabase with the asset registry of the Hansen computerized maintenance management system asset management module on a phased-in basis.	High	2017	Deputy Director of Public Works - Operational Support
26	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should begin with those types of assets that have already been inventoried and utilize those types of assets for the initial syncing with the asset registry of the Hansen computerized maintenance management system.	High	2017	Deputy Director of Public Works - Operational Support
27	Chapter 6 - Analysis of Maintenance Management	Before beginning the initial asset inventory, the Department should develop a plan for how to sync the data within GIS initially and on an ongoing basis.	High	2017	Deputy Director of Public Works - Operational Support
46	Chapter 6 - Analysis of Maintenance Management	Preventive maintenance should be assigned a higher priority than all other work activities other than emergency repairs.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
49	Chapter 6 - Analysis of Maintenance Management	The Deputy Director of Public Works - Operational Support should work with the Information Technology Department to develop a budget proposal for fiscal year 2017-18 to acquire and deploy laptops sufficient for all of the vehicles used every day by the crews of the Department.	Medium	2017	Deputy Director of Public Works - Operational Support
50	Chapter 6 - Analysis of Maintenance Management	The Public Works Department should establish a Steering Committee to provide governance for implementation of the Hansen computerized maintenance management system in the Department.	High	2017	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
51	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should be assigned responsibility for coordination of the ongoing organization, establishment, and installation of the Hansen computerized maintenance management system and the associated maintenance management system in support of the steering committee.	High	2017	Deputy Director of Public Works - Operational Support
52	Chapter 6 - Analysis of Maintenance Management	The Public Works Department should appoint division liaisons for the installation of the Hansen computerized maintenance management system and the maintenance management system.	Medium	2017	Deputy Director of Public Works - Operational Support
53	Chapter 6 - Analysis of Maintenance Management	The City should retain TruePoint to assist in the re-implementation and optimization support of the Hansen for the first phase. That phase includes Enterprise GIS and Engineering Division GIS, wastewater (storm and sewer), water, Facilities Services, warehouse, and customer service. The one-time cost for this assistance would approximate \$443,705.	High	2017	Deputy Director of Public Works - Operational Support
56	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should initiate a predictive testing and inspection program for critical mechanical water assets utilizing contractors.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
57	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should preventively maintain fire hydrants on an annual basis removing the gate cap for the associated hydrant isolation valve, shutting the hydrant off, opening the ports to ensure the gate is working, greasing and lubricating the fire hydrant stem if needed, turning the hydrant on, taking a pressure reading, and painting the hydrant and gate cap.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
61	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should test the registration accuracy of commercial water meters on an annual basis. This should initially be performed contractually, but should be provided with in-house staff subsequently.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
62	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should develop a formal written policy and procedure that stuck meters will be inspected and replaced or repaired within one business day of being reported to the program by the Administrative Services Department.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
63	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should be held accountable for reporting to the Assistant Director – Infrastructure and Field Operations – regarding the status of each stuck meter that is still an open work order in the Hansen computerized maintenance management system. If the meter is still stuck, the Program should repair or replace the stuck meter by the end of August 2016.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
64	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should preventively maintain water distribution valves on a biennial basis by completely operating the valve (close and re-open) and counting the turns based on valve size, paint the valve box to identify the opening direction and the position of the valve.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
65	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should discontinue the contract with the County for administering its backflow device testing program and assume these duties itself.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
66	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should adopt a fee for backflow prevention testing to recover the costs associated with administration of the program, and begin charging owners of backflow devices for the administration of the program.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
67	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should re-issue a request for proposal for maintenance and repair of the SCADA system.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
72	Chapter 8 - Analysis of Engineering	The Engineering Division should develop project plans to include a project description, financing, budget, responsibility for completing the various components of the capital project, extent of coordination necessary with external agencies, measures of success, a risk assessment, communication plan for external and internal communication, how the quality of the project will be achieved, how the project will be transitioned to Infrastructure and Field Operations upon completion; etc.	High	2017	City Engineer
74	Chapter 8 - Analysis of Engineering	The Engineering Division should establish a "gate" meeting process to enhance communication with and buy-in from Project Owners.	High	2017	City Engineer
75	Chapter 8 - Analysis of Engineering	"Gate" meetings should be conducted at the initiation of the capital project, project scope approval (or approval of the final Project Initiation Plan), 30% design, 60% design, and 100% design, punchlist stage of construction, and project	High	2017	City Engineer
76	Chapter 8 - Analysis of Engineering	The facilitator of the "gate" meetings should be the project manager assigned to the capital project by the Engineering Division.	High	2017	City Engineer
77	Chapter 8 - Analysis of Engineering	The Engineering Division should utilize the City's project accounting system in Munis to track the costs associated with the design and inspection of capital projects.	High	2017	City Engineer
82	Chapter 9 - Analysis of Staffing	The Water Supply and Distribution Program should develop a formal written policy and procedure regarding work order priorities.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
83	Chapter 9 - Analysis of Staffing	Priorities should be assigned to work orders so that essential core services are delivered (e.g., preventive maintenance of assets to maintain the original anticipated useful life of a water utility asset).	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
84	Chapter 9 - Analysis of Staffing	Work order priority #3 (scheduled maintenance) and #4 (discretionary maintenance) should only be performed when all of the work orders associated with priority #1 (unscheduled maintenance) and #2 (preventive maintenance) have been completed and there are no pending or backlogged priority #1 and priority #2 work	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
94	Chapter 9 - Analysis of Staffing	The Administrative Services Department should continue to be responsible for ensuring that meter readings are accurate and checking readings for anomalies.	High	2017	Director of Administrative Services & Chief Financial Officer
98	Chapter 9 - Analysis of Staffing	The Water Supply and Distribution Program should develop a written policy and procedure regarding the proper uses of overtime, and install more rigorous management controls regarding the use of overtime.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
99	Chapter 10 - Analysis of GIS	The Civil Engineering GIS Specialist should work with the GIS Coordinator, Information Technology Department to develop and implement a schedule that would result in the completion of the asset registry for the Water Supply and Distribution Program and the syncing of that asset registry with the citywide GIS geodatabase and with the Hansen computerized maintenance management system.	High	2017	Information Technology Director
100	Chapter 10 - Analysis of GIS	If staff resources are a problem in the completion of the asset registry for the Water Supply and Distribution Program, the Civil Engineering GIS Specialist and the GIS Coordinator, Information Technology Department should work together to marshal sufficient GIS staff resources to complete the asset registry.	High	2017	Information Technology Director
101	Chapter 10 - Analysis of GIS	The geodatabase for the Water Supply and Distribution Program should be completed in fiscal year 2016-17.	High	2017	Information Technology Director
103	Chapter 10 - Analysis of GIS	The Information Technology Department and the Public Works Department should work together to develop a written policy and procedure for the syncing of the Hansen and GIS systems including the frequency of syncing (e.g., daily, weekly, etc.).	High	2017	Information Technology Director

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
104	Chapter 10 - Analysis of GIS	The Information Technology Department should work together with the Public Works Department to develop a written policy and procedure regarding GIS data standards so that all location-referenced data collected will be consistent and easily integrated with other GIS data; how the data will be collected, geotagged, and quality controlled; how the data will be updated and with what frequency; where the data will be stored; the analytical tools that will be provided for the analysis of the GIS data; and how the data will be disseminated.	High	2017	Information Technology Director
105	Chapter 10 - Analysis of GIS	The Information Technology Department should use ESRI data models in the design of the water supply and distribution geodatabase to simplify the process of implementing projects and to help promote industry standards to ArcGIS users on behalf of the Public Works Department	Medium	2017	Information Technology Director
108	Chapter 10 - Analysis of GIS	The Information Technology Department should acquire and use an ArcSDE geodatabase on behalf of the Public Works Department	Medium	2017	Information Technology Director
109	Chapter 10 - Analysis of GIS	The Information Technology Department should increase and enhance the use of geoprocessing models and scripts on behalf of the Public Works Department.	Medium	2017	Information Technology Director
110	Chapter 10 - Analysis of GIS	The Information Technology Department should use the Infrastructure Network Editing template on behalf of the Public Works Department	Medium	2017	Information Technology Director
111	Chapter 10 - Analysis of GIS	The Information Technology Department should use the ArcGIS Data Reviewer on behalf of the Public Works Department.	Medium	2017	Information Technology Director
112	Chapter 12 - Analysis of Water Resources	The Water Supply and Distribution Program should report its progress in accomplishing the recommendations contained in the Water Enterprise Plan to the Public Works Commission on an annual basis.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
113	Chapter 12 - Analysis of Water Resources	The Civil Engineer position in the Building and Safety Division should continue to be assigned responsibility for development review on behalf of the Public Works Department to ensure adherence to the standard specifications of the Public Works Department and that the infrastructure and systems are capable of supporting the proposed development.	High	2017	Assistant Public Manager
114	Chapter 12 - Analysis of Water Resources	The Civil Engineer position in the Building and Safety Division should function in the same manner as the GIS Integrator and the Systems Integrator positions in the City, which are budgeted in the Information Technology Department, but assigned to work directly with operating departments. In the instance of the Civil Engineer, the Civil Engineer should be budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
115	Chapter 12 - Analysis of Water Resources	The Water Resources Manager should not be assigned any development review workload on an ongoing basis; this workload should be borne by the Civil Engineer budgeted in the Engineering Division, Public Works Department, but assigned to the Building and Safety Division and physically based at the Building and Safety Division.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
116	Chapter 12 - Analysis of Water Resources	Given the capital project workload associated with the Water Supply and Distribution Program, including the implementation of the Water Enterprise Plan, the two Project Managers positions in the Engineering Division funded by the Water Enterprise Fund should be assigned to Water Supply and Distribution Program capital projects on a full-time basis.	High	2017	Public Works Director

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
121	Chapter 13 - Analysis of Utility Billing	The Water Supply and Distribution Program and the Administrative Services Department should work together to reduce the extent of meter re-reads. This should include the ongoing and proactive reconciliation of meter account data for each billing cycle within Aclara to the meter account data within the utility billing system in Munis. Before each billing cycle, the Field Services Representative should compare the meter account data in Aclara to the meter account data in Munis, identify discrepancies, collect the meter account data in the field to resolve the discrepancies, and enter the correct meter account data in Aclara or Munis.	High	2017	Director of Administrative Services & Chief Financial Officer
122	Chapter 13 - Analysis of Utility Billing	The process to provide proactive reconciliation of meter account data within Aclara to the meter account data within the utility billing system in Munis should be clarified in a formal written policy and procedure developed by the Water Supply and Distribution Program and the Administrative Services Department.	High	2017	Director of Administrative Services & Chief Financial Officer
124	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department and the Water Supply and Distribution Program should work together to assess the coverage of the Data Collector Units in Beverly Hills, and whether additional units should be installed to reduce coverage gaps, the risks of failure from one specific Data Collector Unit, etc.	Medium	2017	Director of Administrative Services & Chief Financial Officer
126	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department should develop the capacity to collect and to report metrics of customer service for the City's utility call center such as % of calls answered within 20 seconds, within 30 seconds, and within 60 seconds; the % of calls abandoned; etc.	High	2017	Director of Administrative Services & Chief Financial Officer
127	Chapter 14 - Analysis of Emergency Planning	The Water Supply and Distribution Program should finalize its draft <i>Water Main Emergency Action Plan</i> .	High	2017	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
128	Chapter 14 - Analysis of Emergency Planning	The Water Supply and Distribution Program, upon finalizing the draft <i>Water Main Emergency Action Plan</i> , should train its staff on an annual ongoing basis in the plan and conduct exercises to enable staff to practice the plan.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
134	Chapter 17 - Analysis of the Plan of Organization	The vacant Water Operations Manager position should be reclassified within the civil engineering series and, under the supervision of the Water Resources Manager position, utilized to coordinate the implementation of the Water Enterprise Plan.	High	2017	Assistant Public Works Director – Infrastructure and Field Operations
135	Chapter 17 - Analysis of the Plan of Organization	The Civil Engineering GIS Specialist should be transferred from the Public Works Department to the Information Technology Department, but continue to be physically based in the Public Works Department administration building.	High	2017	Deputy Director of Public Works - Operational Support
28	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should utilize the inventory data collection tools developed by ESRI for water supply and distribution, street signs, traffic signals, streetlight, bridges and sidewalks, etc.	Medium	2018	Deputy Director of Public Works - Operational Support
29	Chapter 6 - Analysis of Maintenance Management	The Public Works Department should work with the Information Technology Department to install the Hansen computerized maintenance management system Customer Relationship Management module.	High	2018	Deputy Director of Public Works - Operational Support
30	Chapter 6 - Analysis of Maintenance Management	The existence of the Hansen computerized maintenance management system Customer Relationship Management module should be noticed in the City's newsletter when the feature is available.	Low	2018	Deputy Director of Public Works - Operational Support
31	Chapter 6 - Analysis of Maintenance Management	The Field Services Supervisor and the Water System Production / Operations Supervisor should not assign work to their staff without the creation of work orders, and the planning and scheduling of work orders.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
32	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should develop and adopt policies and procedures that require the creation and completion of work orders for any work assigned to the staff of the Program.	High	2018	Deputy Director of Public Works - Operational Support
33	Chapter 6 - Analysis of Maintenance Management	The Field Services Supervisor and the Water System Production / Operations Supervisor in the Public Works Department should review and verify the completeness and the validity of the data in each work order prior to closure of each work order in the Hansen Work Order / Maintenance Management module. This should be accomplished the same day as the work associated with the work order is completed.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
35	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should develop a formal written policy and procedure regarding the review of work orders for validity of the data and the completeness by the first line supervisor.	High	2018	Deputy Director of Public Works - Operational Support
36	Chapter 6 - Analysis of Maintenance Management	All of the materials used by the crews in their maintenance and repair work should be entered into work orders in the Hansen Work Order / Maintenance Management module.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
37	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should complete written policies and procedures regarding the day-to-day use of Hansen by the staff of the Department.	High	2018	Deputy Director of Public Works - Operational Support
38	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should provide the staff of the Public Works Department with copies of the policies and procedures, provide training in their use and application, and provide the opportunity to answer questions. The Public Works Director, Assistant Directors, and the middle managers of the Department should then hold the staff accountable for compliance.	High	2018	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
39	Chapter 6 - Analysis of Maintenance Management	The Public Works Department should "go live" with the Hansen Inventory Manager module, with the complete deployment of the module to record equipment and materials.	High	2018	Deputy Director of Public Works - Operational Support
40	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should work with the first-line supervisors of the Department to define the work activities including the activity, the activity description, and the unit of measure.	High	2018	Deputy Director of Public Works - Operational Support
41	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should work with the first-line supervisors of the Department to define the service level standards for the work activities performed by the Department.	High	2018	Deputy Director of Public Works - Operational Support
42	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should work with the first-line supervisors of the Department to develop activity guides for the work activities performed by the Department.	High	2018	Deputy Director of Public Works - Operational Support
43	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office should work with the first-line supervisors of the Department and with the Information Technology Department to develop an annual work program for each section and division within the Public Works Department that uses the Hansen computerized maintenance management system, and to develop reporting systems to report budget to actual.	High	2018	Deputy Director of Public Works - Operational Support
44	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office within the Public Works Department should work with the first-line supervisors of the Department and the Information Technology Department to develop and deploy formal work planning and scheduling systems using the Hansen computerized maintenance management system.	High	2018	Deputy Director of Public Works - Operational Support
45	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office, Public Works Department should develop a formal written policy and procedure that provides guidelines for the priorities to be assigned by managers and supervisors to work activities.	High	2018	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
48	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office within the Public Works Department should work with the first-line supervisors of the Department and with the Information Technology Department to develop and deploy a monthly performance report comparing planned versus actual performance and costs. This monthly report should be developed using Hansen computerized maintenance management system.	High	2018	Deputy Director of Public Works - Operational Support
54	Chapter 6 - Analysis of Maintenance Management	Subsequently, the Public Works Department should proceed on its own with the re-implementation and optimization of the Hansen computerized maintenance management system based upon the support of the Asset Management Office and the Information Technology Department. It should also place TruePoint on retainer to assist the City in subsequent phases of re-implementation and optimization of the Hansen computerized maintenance management system as necessary.	High	2018	Deputy Director of Public Works - Operational Support
55	Chapter 6 - Analysis of Maintenance Management	As necessary, the City should utilize limited-term positions within the Information Technology Department to assist with the re-implementation and optimization of the Hansen computerized maintenance management system subsequent to the first phase.	High	2018	Deputy Director of Public Works - Operational Support
58	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should preventively maintain air release valves on an annual basis opening and flushing, inspecting for leakage, and replacing the resilient seats as necessary.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
59	Chapter 7 - Analysis of Preventive Maintenance	The Water Supply and Distribution Program should preventively maintain cla-valves on an annual basis by exercising the valves, painting the valves, flushing of all the plumbing and confirmation of proper operation, and recording of upstream and downstream pressures.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
60	Chapter 7 - Analysis of Preventive Maintenance	All cla-valves should be re-built on a 5-year schedule at which time the valves should be disassembled and inspected, any worn parts replaced, and the valve reassembled before returning to service; this service should be provided contractually.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
68	Chapter 8 - Analysis of Engineering	The Engineering Division should develop a <i>Capital Improvement Projects Development and Management Handbook</i> .	Medium	2018	City Engineer
69	Chapter 8 - Analysis of Engineering	The Engineering Division should develop an on-line version of the <i>Capital Improvement Projects Development and Management Handbook</i> (i.e., the guide should be published to the Division's Intranet).	Medium	2018	City Engineer
70	Chapter 8 - Analysis of Engineering	The City Engineer should develop a formal written policy and procedure that clarifies responsibility for managing all of the engineering aspects of the delivery of the City's capital projects from "cradle to grave" as being assigned to the Engineering Division.	Low	2018	City Engineer
71	Chapter 8 - Analysis of Engineering	A summarized twenty-four month bar chart schedule should be prepared for all capital projects that will be designed and scheduled by the Engineering Division	High	2018	City Engineer
73	Chapter 8 - Analysis of Engineering	The Engineering Division should utilize cost of construction guidelines to determine the staffing requirements for each capital improvement program project in terms of person hours required for design and construction inspection.	Medium	2018	City Engineer
78	Chapter 8 - Analysis of Engineering	The City Engineer should prepare a resource loaded project schedule for all of the capital projects that will be designed and inspected during that fiscal year.	High	2018	City Engineer
79	Chapter 8 - Analysis of Engineering	The Engineering Division should expand its existing monthly capital improvement program project status report.	High	2018	City Engineer
80	Chapter 8 - Analysis of Engineering	The monthly capital improvement program project status report should be posted to the Engineering web site each month.	High	2018	City Engineer
81	Chapter 8 - Analysis of Engineering	The monthly capital improvement program project status report should be used as the basis by the Engineering Division for monthly meetings with Project Owners.	High	2018	City Engineer

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
85	Chapter 9 - Analysis of Staffing	The Water System Inspector should develop and maintain a database containing all of the permitted backflow devices in Beverly Hills. Once the database is developed, it should be maintained by clerical support staff within the Public Works Department.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
86	Chapter 9 - Analysis of Staffing	The City should maintain a list of State-certified backflow device inspectors and provided to those commercial and industrial businesses with these devices or a link to the County Health Department, who maintains and updates such a list.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
87	Chapter 9 - Analysis of Staffing	The City should send out notices annually to the commercial and industrial businesses with backflow prevention devices requiring testing, along with a list of certified local testers. This notice can be automated, and the notices mailed to commercial and industrial businesses with backflow prevention devices by clerical support staff.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
88	Chapter 9 - Analysis of Staffing	The commercial and industrial businesses should be required to provide the City with the results of the test and inspection and any repairs to the device. These results should be forwarded to the clerical support staff within the Public Works Department, who should maintain the backflow devices database. If commercial and industrial business do not respond, reminder notices should be mailed by the clerical support staff and, ultimately, the commercial and industrial businesses forwarded to Code Enforcement for failure to respond.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
89	Chapter 9 - Analysis of Staffing	The Water Supply and Distribution Program should maintain an employee who is a State-certified backflow device inspector.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
91	Chapter 9 - Analysis of Staffing	Entering Water Supply and Distribution Program crew information from work orders into the Hansen computerized maintenance management system should be automated; crews should be provided with tablets or mobile data terminals and should enter this information into the Hansen computerized maintenance management system themselves.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
92	Chapter 9 - Analysis of Staffing	Ensuring that new water meters are entered into the utility billing program should be automated through an interface between the Hansen computerized maintenance management system and the utility billing system.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
93	Chapter 9 - Analysis of Staffing	The utility billing system should link to the Hansen computerized maintenance management system to generate reports for the replacement of meters when meters fail (e.g., zero reads).	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
102	Chapter 10 - Analysis of GIS	The Information Technology Department should establish a citywide GIS governance committee. The GIS Governance Committee should be assigned responsibility to guide GIS implementation development for the City. The GIS Governance Committee consists of upper management staff from major City departments.	Medium	2018	Information Technology Director
106	Chapter 10 - Analysis of GIS	The Information Technology Department should use ESRI geometric networks for the water supply and distribution geodatabase, a set of connected edges (lines) and junctions (points), along with connectivity rules to represent and model a common network infrastructure on behalf of the Public Works Department	Medium	2018	Information Technology Director
107	Chapter 10 - Analysis of GIS	The Information Technology Department should use the ESRI ArcGIS Workflow Manager for the water supply and distribution geodatabase on behalf of the Public Works Department	Medium	2018	Information Technology Director

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
117	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department should develop a proposal for the consideration of the City Council regarding the costs and benefits of the conversion of water utility billing from bi-monthly billing to monthly billing.	Medium	2018	Director of Administrative Services & Chief Financial Officer
118	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department should mail the final notice that the City will initiate shut off at 36 calendar days after the initial bill was mailed and the notice to suspend service at 45 calendar days after the initial bill being mailed.	High	2018	Director of Administrative Services & Chief Financial Officer
119	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department should increase the % cost for late payments to 2% per month.	High	2018	Director of Administrative Services & Chief Financial Officer
120	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department should acquire web interface commercial off the shelf software to enable electronic billing, payment, and communication with utility customers.	Medium	2018	Director of Administrative Services & Chief Financial Officer
123	Chapter 13 - Analysis of Utility Billing	When the Public Works Department proceeds forward with the re-optimization of the Hansen computerized maintenance management system within the Water Supply and Distribution Program, the utility billing unit in the Administrative Services Department should be provided with access so that unit can issue work orders on-line to the Program to request meter re-reads, the repairs or replacement of stuck meters, etc.	High	2018	Director of Administrative Services & Chief Financial Officer
125	Chapter 13 - Analysis of Utility Billing	The Administrative Services Department and the Water Supply and Distribution Program should work together to develop a written operational plan for the system-wide replacement of the meter transmission units.	Low	2018	Director of Administrative Services & Chief Financial Officer

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
129	Chapter 15 - Analysis of Administration	The Water Supply and Distribution Program should develop a strategic plan to include goals, objectives, and metrics to measure the successful implementation of the strategic plan.	Medium	2018	Assistant Public Works Director – Infrastructure and Field Operations
130	Chapter 15 - Analysis of Administration	The Water Supply and Distribution Program should develop goals, objectives, and performance measures for each functional area within the Division.	Medium	2018	Assistant Public Works Director – Infrastructure and Field Operations
131	Chapter 16 - Analysis of Real Property	The Public Works Department should assign responsibility to its Assistant Property Manager position, once filled, to conduct a market-based rent analysis of these three properties - 333 South La Cienega Boulevard, the West Hollywood pipe yard, and the Public Works facility at 345 North Rexford - and develop recommendations regarding the rent that should be paid by the General Fund to the Water Enterprise Fund for these three properties that reflects their market-based rent, given the current conditions of the property.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
132	Chapter 16 - Analysis of Real Property	The Assistant Property Manager position should also be assigned responsibility for developing recommendations regarding the appropriate market-based rent that should be provided by the Water Enterprise Fund to the General Fund for properties “owned” by the General Fund, but used by the Water Enterprise Fund for water storage tanks.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations
133	Chapter 17 - Analysis of the Plan of Organization	Upon the retirement of the Water Operations Manager, the Water Resources Manager position should be assigned responsibility for managing the Water Supply and Distribution Program.	High	2018	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
14	Chapter 5 - Analysis of Asset Management	In addition, in the longer-term, as the Hansen computerized maintenance management system is re-optimized, two Planner and Scheduler positions should be authorized for the Public Works Department within the Asset Management Office to plan and schedule the work of the various field operations staff within the department, to update the asset registry, to facilitate condition assessments, etc.	Medium	2019	Deputy Director of Public Works - Operational Support
19	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should conduct periodic asset condition assessments of the assets under the stewardship of the Public Works Department.	Medium	2019	Deputy Director of Public Works - Operational Support
20	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should prepare a five-year plan for the renewal and replacement of the assets assigned to the Department's stewardship. These long-term plans for the renewal and replacement of assets should be developed for the water supply and distribution system, storm water collection system, sanitary sewer collection system, traffic signal system, regulatory signs, etc.	Medium	2019	Deputy Director of Public Works - Operational Support
21	Chapter 5 - Analysis of Asset Management	The five-term plans for the renewal and replacement of the assets assigned to the Department's stewardship should be prepared by the Asset Management Office with the advice and consultation of the asset managers.	Medium	2019	Deputy Director of Public Works - Operational Support
34	Chapter 6 - Analysis of Maintenance Management	The Field Operations and Infrastructure staff of the Public Works Department should periodically be provided with training in the use of the Hansen Work Order / Maintenance Management module.	High	2019	Deputy Director of Public Works - Operational Support

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
47	Chapter 6 - Analysis of Maintenance Management	The Asset Management Office, Public Works Department should revise the work order used by the Water Supply and Distribution Program to include a standard activity definition (e.g., exercise <16" distribution valves), the priority of the work, the performance measure for the number of units completed (e.g., the number of <16" distribution valves that were exercised), a category definition for the work activity (e.g., scheduled maintenance, preventive maintenance, scheduled corrective maintenance, unscheduled corrective maintenance, etc.).	High	2019	Deputy Director of Public Works - Operational Support
90	Chapter 9 - Analysis of Staffing	Through attrition, the Water Systems Inspector should be reclassified within the Water Worker classification series. The position should report to the Field Services Supervisor. The position should be utilized for the maintenance and repair of the water supply and distribution system, but also expected to administer the City's backflow prevention device program as workload requires (e.g., one workday a week).	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
95	Chapter 9 - Analysis of Staffing	In the mid to long-term, the other responsibilities of the Water System Technician should be assigned to the Water Workers within field operations in the Water Supply and Distribution Program. This includes replacing meter transmission units, performing fire flows and pressure testing and provides results to customers, as requested, etc.	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
96	Chapter 9 - Analysis of Staffing	Through attrition, the Water System Technician should be reclassified within the Water Worker classification series. This position can be more efficiently utilized if the position can perform a myriad of work related to maintenance and repair of water supply and distribution assets, not just water meters.	High	2019	Assistant Public Works Director – Infrastructure and Field Operations
97	Chapter 9 - Analysis of Staffing	Through attrition, three Water Worker III positions should be eliminated when the SCADA system is fully functional, staff have been fully trained in the use of the system, the response to alarms, and how to remotely respond and remediate alarms at the plant.	High	2019	Assistant Public Works Director – Infrastructure and Field Operations

Rec. #	Chapter	Recommendation	Priority	Schedule	Responsibility
22	Chapter 5 - Analysis of Asset Management	The Asset Management Office, Public Works Department should report annually on the progress of the Department in implementation of effective asset management practices.	Medium	2020	Deputy Director of Public Works - Operational Support
23	Chapter 5 - Analysis of Asset Management	The annual asset management report should report progress in implementation of the infrastructure master plans (e.g., water supply and distribution master plan).	Medium	2020	Deputy Director of Public Works - Operational Support
24	Chapter 5 - Analysis of Asset Management	The Public Works Department should develop an infrastructure report card and assessment that provides an evaluation of the state of the City's assets. The report card should be included in the 5-year capital improvement program budget.	Low	2020	Deputy Director of Public Works - Operational Support