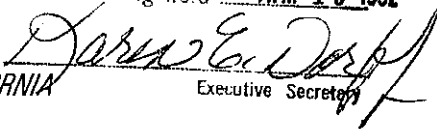
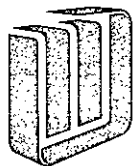


at its meeting held MAR 10 1992
Executive Secretary**MWD**

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

February 18, 1992

To Board of Directors (Engineering and Operations Committee--Information)
(Organization and Personnel Committee--Information)

From: General Manager

Subject: Report of Organizational Review of the Operations Division

Report

At its July 1991 meeting, your Board authorized the General Manager to enter into an agreement with R. W. Beck and Associates, management consultants, to conduct a review of the Operations Division. The scope of their review was to include:

- a. Is there a more efficient way to organize and manage the division?
- b. Are titles and salary placements within the division consistent with other divisions and with others outside the District?
- c. Are supervisory relationships appropriate?
- d. A discussion of the staffing level of the division relative to its current and future tasks, including impacts of the System Overview Study, regulatory compliance, and maintenance.
- e. Is the division's labor pool being used efficiently?
- f. Should some division functions be transferred to other divisions; should some functions of other divisions be transferred to the Operations Division?
- g. Is the division properly staffed with appropriate specialities to deal with current and potential environmental and worker-safety regulations?

This study has been completed and the recommendations contained in the consultant's report are being evaluated by the management staff.

February 18, 1992

The consultant has prepared the attached Executive Summary which covers many of their principal findings and recommendations. The full report is available on request should any director wish to review the details of this study.

The principal members of the R. W. Beck and Associates evaluation team will be available to discuss their findings at the April meetings of the Engineering and Operations and Organization and Personnel committees.

Board Committee Assignments

This letter is referred for information to:

The Engineering and Operations Committee because of its authority to study, advise, and make recommendations with regard to the operation, protection, and maintenance of the plants and facilities pursuant to Administrative Code Section 2431(c); and

The Organization and Personnel Committee because of its authority to study, advise, and make recommendations with regard to periodic independent reviews and studies of the organization, the classification of position, job duties, salaries, and salary ranges; and the terms and conditions of employment of all consultants, advisors, and special counsel pursuant to Administrative Code Section 2471(b) and (g).

Recommendation

For information only.


for Carl Boronkay

JWM/sjm

Attachments

39519

9-11



MWD

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Executive Summary

Organizational Review of the Operations Division

February 1992

MANAGEMENT CONSULTING

R.W. BECK
AND ASSOCIATES

R.W. BECK
AND ASSOCIATES

39519

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WS-3903-AA1-AA

February 24, 1992

Jay Malinowski
Assistant Chief of Operations
Metropolitan Water District
1111 Sunset Boulevard
Los Angeles, California 90054

Dear Mr. Malinowski:

R. W. Beck and Associates is pleased to deliver the final report on our organizational review of the District's Operations Division. The report is presented in three volumes:

- Executive Summary
- Final Report
- Final Report—Appendix

The Executive Summary presented in this volume provides a brief description of the Operations Division and some of its current challenges, an evaluation of the Division, and a partial listing of what we regard as the most significant of the study's recommendations.

We sincerely appreciate the support we received during the study period from all the District's management and the openness and sincerity with which all the employees addressed our requests for information and participated in the interview process.

Very truly yours,

R. W. BECK AND ASSOCIATES


Charles P. Sitkin

Director, Management Consulting

CPS:bb



MWD

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Executive Summary

Organizational Review of the Operations Division

February 1992

MANAGEMENT CONSULTING

R.W. BECK
AND ASSOCIATES

**METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA
OPERATIONS DIVISION, ORGANIZATIONAL REVIEW
EXECUTIVE SUMMARY**

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EXECUTIVE SUMMARY

INTRODUCTION

In April 1991, Metropolitan Water District of Southern California issued a Request for Proposal (RFP) for a wide-ranging study of the District's Operations Division. After a thorough selection process, R. W. Beck and Associates was selected as the independent firm to perform this Organizational Review. R. W. Beck is a national engineering and consulting company that specializes in providing services to public utilities and municipal governments.

The purpose of the study as stated in the RFP was to assist the District in measuring the effectiveness of the present organization and staffing and to recommend any changes deemed appropriate.

During the course of the review of the District's Operations Division, the R. W. Beck consultants covered the broad range of activities of this large, geographically dispersed, and complex Division. Four primary data gathering techniques were used during the study:

- Interviews (see Appendix I for a list of interviewees)
- Documentation review
- Field observations
- An attitudinal survey of all employees.

It is a pleasure to note that R. W. Beck received the full cooperation of management and employees during the entire study.

The first section of this document, the Executive Summary, summarizes the main findings and recommendations of the full report; the second section, Summary of Recommendations, consolidates the most important of the specific recommendations found in the full report.

OVERVIEW OF THE ORGANIZATION

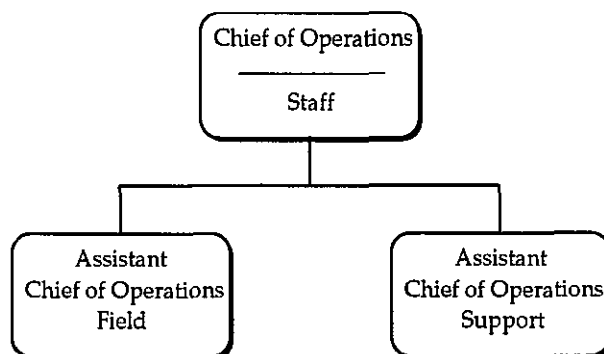
The Operations Division has as its primary mission the transmission, treatment, and wholesale distribution of water to various agencies in Southern California. Its organization includes a wide variety of staff and operational units to accomplish this mission. The Division is responsible for:

METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

- Operation and maintenance of the pump plants, aqueduct, and support infrastructure delivering Colorado River water to the Southern California distribution system
- Operation and maintenance of the Southern California distribution system including transmission facilities for State Water Project water, filtration and treatment plants, reservoirs, transmission mains, pipelines, control structures, and support infrastructure
- Management of relations with member agencies regarding water service, billings, and shutdown schedules
- Design, development, implementation and maintenance of telemetering, SCADA, and other monitoring and control systems for water and power operations
- Related internal functions such as information systems support (shared with the Information Systems Division), budgeting, time keeping, provision of administrative support, development of operating manuals, provision of technical training, emergency preparedness planning, providing security at field sites, expediting new service connections, reading meters, sampling water, (currently) performing major rehabilitation on the Colorado River Aqueduct pumps, and numerous construction projects.

To perform these functions, the Operations Division maintains a payroll of about 1,000 personnel. It is managed by a Chief of Operations who is directly supported by two Assistant Chiefs:

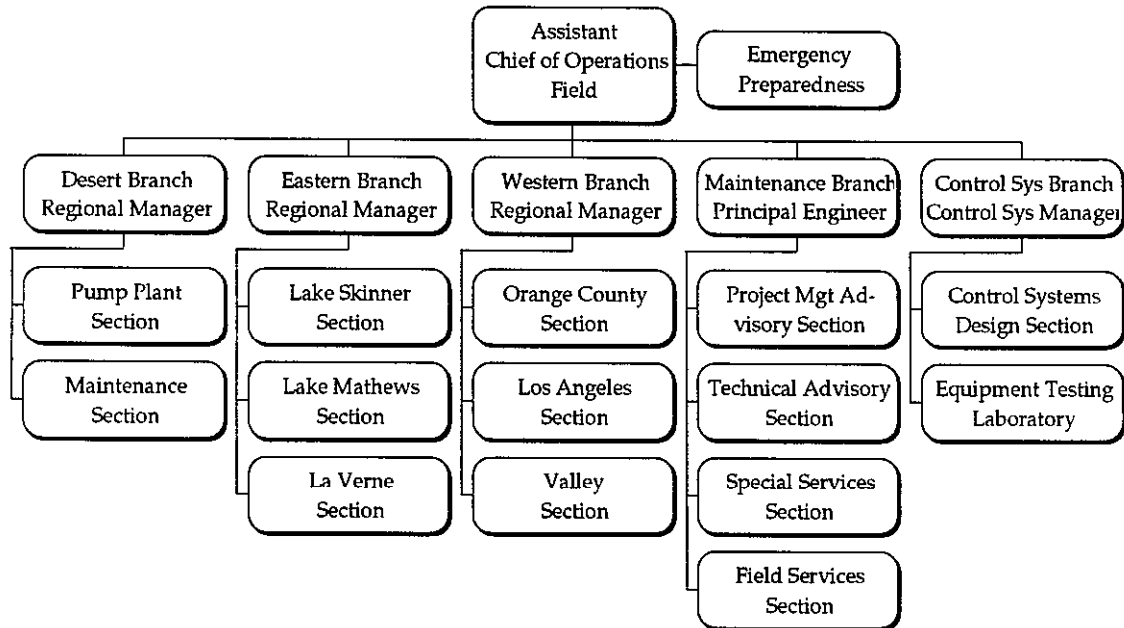
Current Top-level Operations Division Structure



The **Assistant Chief of Operations** nominally in charge of Field Operations manages the Desert Branch, the Eastern and Western Branches, the Maintenance Branch, and the Control Systems Branch:

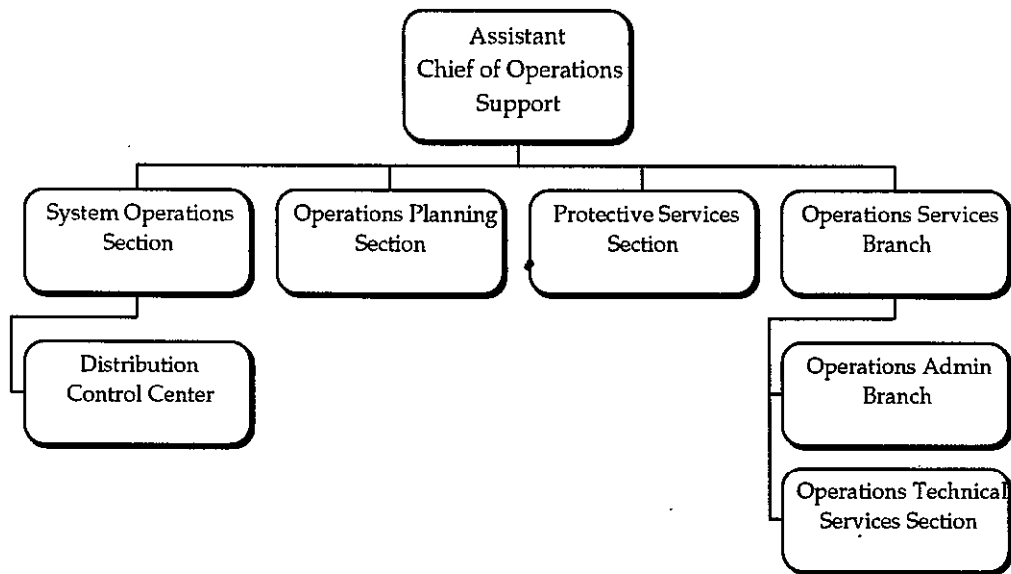
METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

Current Field Operations Organization



The Assistant Chief of Operations nominally in charge of support functions manages water and power control and dispatch functions, relations with member agencies, security, Divisional administrative functions, training, and development of manual procedures:

Current Support Operations Organization



CHALLENGES FACING THE OPERATIONS DIVISION

In performing this study, we were struck forcefully by the climate of change in which the Division operates. Change is now probably more intense than it has been since the construction of the Colorado River Aqueduct in the 1930's:

- Regulatory changes have made more complex almost every aspect of the Division's operations. These changes impact the daily activities of crews and supervisors in a major way. Activities such as entering confined spaces, dealing with minor chemical spills, choosing and recording use of solvents, painting and cleanup, renovation of structures, and disposal of everyday wastes have all become more onerous and complex due to various federal and state regulations.
- Regulatory changes have also impacted water treatment, requiring a fundamental change in the attitudes of the plant operators. Whereas previously the operating philosophy was to deliver the required quantity of water without violating water quality limits, now operators must strive for the highest possible water quality while trying to deliver the required quantity of water. Future regulatory changes promise to make stringent control of water quality an increasingly important and difficult task.
- At the same time, the environment has become far more litigious. Division employees fear not only civil lawsuits for negligent actions, but also the potential for criminal indictments under certain non-volitional circumstances. Indeed, such indictments have already occurred, although they were ultimately dropped.
- Finally, the competition for scarce water resources is growing more intense. Several years of drought in Southern California have made system operations and the allocation of resources far more difficult.

Within this climate of change and increased regulatory complexity, the Division is trying to change its operating style to meet its new challenges. Organizational inertia is a major problem, compounded by the longevity of key managers and employees. Division Management's recognition that organizational change is required was one of the reasons for this study.

CAPSULE SUMMARY OF FINDINGS

The Division is operating well. Facilities appear to be in good repair, a strongly defined and experienced organization is in place, and water treated to specifications is flowing uninterrupted to MWD's member agencies.

METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

The quality of the Division's management personnel, from top management levels to first line supervisors, is impressive. Most appear capable, experienced, and committed to MWD's mission. They are cost-conscious, planful to a degree, and interested in management modernization.

With respect to the organization and its operating style, we find:

- The Division has a strongly defined organization and experienced, competent management. It continues to fulfill its mission in a professional manner.
- Much of the success of the Division arises from the quality and experience of its line management, a status that generally exists through all managerial levels.
- There are few documented procedures for routine operational and maintenance activities. Plant operations manuals are largely incomplete. Division-wide maintenance programs do not exist. Inventories of items requiring maintenance are generally unavailable. There is little evidence that these shortcomings seriously affect current operations, because the expertise and system familiarity of current supervisors ensures that needed work is accomplished—however, there is reason for concern about the future.
- Over fifty percent of all Division managers from first-line supervisors through the Chief of Operations are eligible for retirement within five years. When they leave, their knowledge and expertise will leave with them. Because of the lack of documented procedures and formalized programs, a serious potential impediment exists to the Division's ability to effectively fulfill its mission in the future. This situation will be exacerbated if management replacements come in any large degree from outside the organization.
- Meanwhile, the environment in which the Division operates will grow more stressful with increasing regulation and a planned large-scale capital improvements program.

In short, we find that the Operations Division is a competent, experienced, and professional organization facing a major challenge: While current management is experienced and capable, over 50% of all managers and supervisors will be eligible for retirement within five years. But institutional learning is largely undocumented; to the extent that this institutional learning is lost, the general lack of formalized maintenance and operations procedures may cause a major succession crisis, potentially threatening the mission of the Division.

Current management can deal with system requirements because they have operated the system from inception and know it thoroughly. They have the commitment and work ethic which may not always be replaceable. Whether the Division can expect as well from its next generation of management is a matter of conjecture.

Much of this Report dwells on the need for documentation and formalization of procedures to prepare the way for new management. Supporting programs must be started immediately and existing programs must be strengthened. Current top management should take immediate action in this direction because top management will be retiring in the very near future; it may take time for replacements to acclimatize sufficiently to be effective.

Although the recommendations in this report are more future-oriented than remedial, prompt implementation should be considered where practical. Several recommendations will result in major organizational efforts whose full effects will be felt only over a number of years. Given the short time period until the expected management turnover (which actually is now beginning), an earlier implementation will have a better chance of ultimate success.

This Report recommends that an immediate and aggressive program be undertaken to document and formalize operations and maintenance procedures within the Division. Much of the discussion in the report concentrates on areas where such programs need to be developed.

There is also an urgent need for management succession planning. Since the most senior level managers will be those generally retiring first, immediate planning should be undertaken in this area.

FINDINGS RELATED TO ORGANIZATION

Two major recommendations of the report deal with positioning the Chief of Operations within the District organization and realigning the internal organization so that the reporting levels and allocation of authority will be commensurate with the responsibilities assigned to these Operations Division Managers.

Chief of Operations—The Chief of Operations, given his scope of responsibility and the fundamental nature of his mission, should report directly to the General Manager.

The current positioning of the Operations Division within the District is an anomaly from three standpoints:

- The Chief of Operations is directly responsible for fulfilling MWD's primary mission—the delivery of water to MWD's customers. In this sense, the Operations Division is the "engine" of MWD. The functions of most of

METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

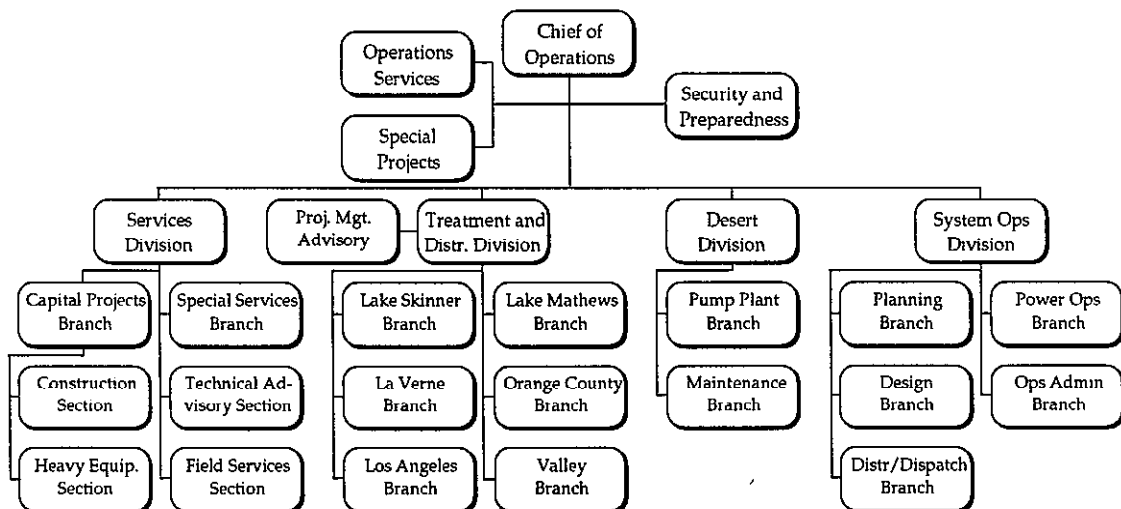
MWD's other divisions are essentially supportive of the mission of the Operations Division.

- Substantially all the physical assets of MWD are under the jurisdiction of the Chief of Operations. The extent, value, and complexity of these assets are considerable.
- In terms of head count, the Operations Division accounts for about one-half of MWD's total personnel—one thousand out of two thousand. The average number of personnel in MWD's other divisions is between 80 and 85. As a matter of fact, the Chief of Operations is responsible for far more personnel than either of the other two Assistant General Managers. This disparity in personnel creates a significant imbalance in MWD's overall organizational structure.

In evaluating this situation, we looked carefully for reasons that might justify the current reporting position of the Operations Division. We could find no convincing structural arguments as to why the Division should not report directly to the General Manager.

Internal Organization—The Division should be reorganized into four line divisions reporting to the Chief of Operations. A separate Construction Branch should be created within a Services Division. Activities relating to system control, dispatch, and SCADA and other control and telemetering systems should be consolidated into a System Operations Division:

Proposed Operations Division Organization



This proposed structure has several advantages over the current structure:

- It generally results in a broader and more consistent span of control.
- It reduces the levels of management between the General Manager and the field workers by two (including the effect of having the Chief of Operations report directly to the General Manager).
- It groups like functions and reduces fragmentation.
- It promotes leveling of work in the field sections currently comprising the Eastern and Western Branches through reassignment of the construction function.
- It promotes uniformity of procedures across the same field sections.
- In general, it provides a framework for implementing several other major recommendations of this report:
 - Accelerated development of preventive maintenance programs
 - Centralization and proactive control of training
 - Implementation of more formal field procedures regarding time recording and work tracking.

FINDINGS RELATED TO STAFFING LEVELS

It is useful to review historical staffing trends in the Operations Division in several ways:

- As they have changed over time
- As field personnel levels have changed relative to administrative and support staffing levels within the Division
- As field personnel levels have changed relative to staffing levels outside the Division
- As field personnel levels have changed relative to the amount of water treated.

The following table shows the data supporting these analyses. Personnel counts shown are authorized positions, averaged from beginning-of-year and end-of-year figures. They may not agree exactly with personnel counts shown elsewhere in the report which, depending on the source of the information and the use of the data, may show point-in-time personnel counts or actual incumbent counts rather than authorized positions.

METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

Personnel and Water Treated, FY 1988-91

	<u>FY88</u>	<u>FY89</u>	<u>FY90</u>	<u>FY91</u>	
Ops Division, field personnel	749	767	775	773	Personnel, average
Ops Division, support/admin	<u>224</u>	<u>237</u>	<u>247</u>	<u>280</u>	Personnel, average
Ops Division total	973	1,004	1,022	1,053	Personnel, average
Remainder of MWD	<u>587</u>	<u>680</u>	<u>808</u>	<u>878</u>	Personnel, average
Total MWD	<u>1,560</u>	<u>1,684</u>	<u>1,830</u>	<u>1,931</u>	Personnel, average
Water treated	1,296	1,354	1,466	1,438	000's of acre-feet

Analysis of these data yield the following total percentage changes over the four-year period:

Growth in Personnel and Water Treated, FY 1988-91

	<u>Pct Change, FY 88-91</u>
Employees: Operations Division, field	3.20%
Operations Division, admin	25.00%
Operations Division, total	8.22%
Remainder of MWD	49.49%
Total MWD	23.75%
Indicators: Water treated	10.96%

It is immediately apparent that staffing growth in the Operations Division has been less than growth outside the Division and less than volume of water treated. Growth in the field sections in particular (Desert Branch, Eastern Branch, Western Branch, and Special Services Section) has been almost nil.

This growth has occurred over a period of increasing regulation and heightened awareness of water quality issues. Our interviews revealed that almost all areas within the Operations Division have been affected by the changing environment, either through major changes in work methods, increases in record-keeping

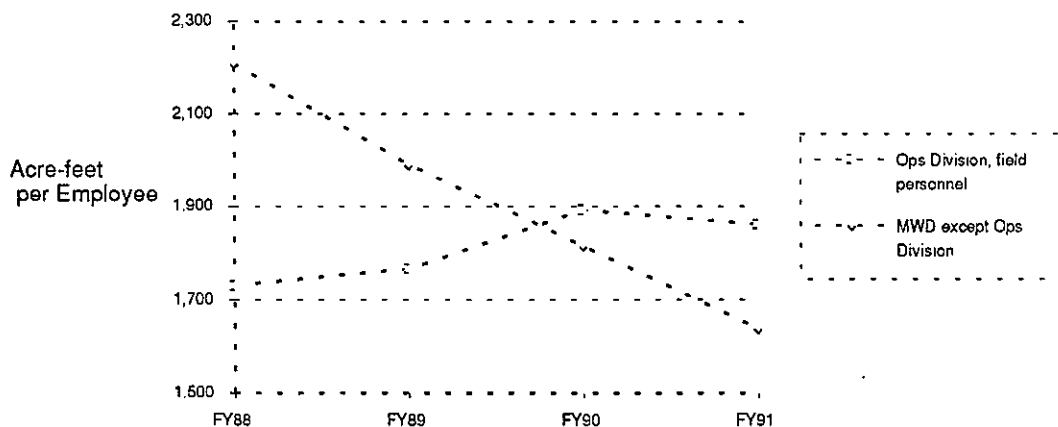
METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

requirements, extra work in preparing materials requisitions, or in any of several other ways.

During this period the growth of staffing in administrative and support areas, both within the Division and without, reflects the increasing costs of doing business brought about by increasing demands of safety, water quality, and environmental compliance. But within the field organizations, where the bulk of the Division's manpower resides and where increasing regulation has had an obvious and visible impact, almost no growth has taken place. The extra work has been largely absorbed by existing staff.

The result, when considered alongside increased water treatment volumes, is that the water processed per employee in the field operations has actually increased over the past four years, while water processed per employee in the non-operational portion of MWD has decreased:

*Metropolitan Water District
Acre-feet of Water Treated per Employee*



This picture of apparently increasing efficiency of Operations Division field personnel must, of course, be viewed with caution. Within a normal range of operational volumes, so long as the system is operating within rated capacities, fluctuations in water flow would not normally be accompanied by corresponding fluctuations in staffing. It is apparent, nonetheless, that field staffing has increased less than water flow, notwithstanding the increasing complexity of the system and of the regulatory environment.

Field staffing numbers have not been adjusted for the loss of certain functions, notably water quality and environmental compliance. They do include the new First Responder positions, however, who more than make up for the positions lost. Hence, the above graph gives a fair representation of the relative changes

in personnel productivity trends within the Division and between the Division and the remainder of the District.

Lack of growth in numbers of field personnel may have a cost. Interviews revealed that most first-line supervisors believe system maintenance needs are not being adequately addressed due to manpower limitations. To the extent that they would comment, Area Superintendents and their assistants agreed. While it is difficult to quantify any shortfall in the maintenance area because maintenance needs and service levels have never been adequately defined, we believe that the absorption of substantial additional work by field staff may have led to a situation of deferred maintenance. If so, the situation poses a significant threat to the Division's ability to carry out its mission effectively in the future.

In any event, it is clear that any over staffing which may have existed in the field organizations four or five years ago has by now been significantly reduced by additional workload from regulatory requirements and increased production volumes.

It was impossible to determine sufficiency of staffing through traditional means because of the lack of formal procedures, defined service levels, and other factors which are normally used to estimate the resources required to perform tasks. A review of overtime, backlogs, comparative statistics, and staffing trends indicates that the Division is appropriately staffed to accomplish the work it is now doing.

This situation may well change as procedures are formalized and the work which should be done is defined. On one hand, the maintenance work (especially preventive maintenance work) is probably not receiving sufficient attention; on the other hand, formalization of work programs should increase overall efficiency. The Report recommends that construction activities be organizationally removed from the field areas to further increase efficiency of accomplishment of routine work.

FINDINGS IN OTHER AREAS

This Report makes recommendations in several other areas relating to the Division's activities. The purposes of these recommendations are twofold:

- 1) To increase the efficiency with which the Division uses its resources to fulfill its mission; and
- 2) To ensure that the Division's mission can continue to be effectively fulfilled in the future.

Only the most major recommendations are mentioned below; additional recommendations are presented in the next section:

METROPOLITAN WATER DISTRICT, OPERATIONS DIVISION

Human Resources—The Division should conduct a classification study to resolve apparent distortions of the classification system which are perceived to negatively affect positions in the Operations Division. Degree requirements for Division positions should be evaluated carefully and only on a position-by-position basis.

System Maintenance—The Division should undertake a major program to implement field-oriented preventive maintenance systems. First-level supervisors should be deeply involved and should have ownership of the systems. Project Management Advisory Services should coordinate the program and provide Maintenance Analysts to the field areas.

First Responders—Off-shift supervision of treatment plant operating crews should be implemented in conjunction with a need to supervise off-shift First Responders.

Training—Training in the Division should be approached on a programmatic basis. All training should be coordinated through Operations Services.

Information Systems—Field units should be far more involved in definition and development of field support systems. Management should exercise more initiative in evaluating the potential for personal computers to enhance productivity.

SUMMARY OF RECOMMENDATIONS

This section of the Executive Summary contains the most important of the recommendations included in the Final Report. Further details on these recommendations and supporting discussions may be found in the Final Report.

ORGANIZATION

- 3.1 Change the reporting relationship of the Chief of Operations to directly report to the General Manager.
- 3.2 The structure of the Operations Division of MWD should be modified to reflect four divisions reporting to the Chief of Operations:
 - Desert Division
 - Treatment and Distribution Division
 - Services Division
 - System Operations Division.
- 3.3 Three staff units should also be formed from existing resources:
 - Security and Preparedness Branch
 - Operations Services Branch
 - Special Projects Branch.
- 3.7 The duties of the two Assistant Area Superintendents in each section should be more clearly defined as Operations Section Manager for one and Maintenance Section Manager for the other. The practice of "manpower balancing," or seeking to artificially balance the size of the organizations reporting to the two positions, should cease.
- 3.8 Construction-related personnel should be transferred out of the operating sections and into a new Construction organization.
- 3.9 The Plant Laboratories should be removed organizationally from the treatment plants and attached to the Water Quality Division.

STAFFING LEVELS

- 4.1 Develop an integrated structure of goals and objectives, from Division management on down.
- 4.2 Develop a documented and accepted structure of priorities.

- 4.3 Develop and implement an effective work planning system.
- 4.4 Make the integrity of data a stated goal and a high priority.
- 4.6 Assessment of performance against budget should be a management priority.

SYSTEM MAINTENANCE

- 5.1 First level supervisors with maintenance and scheduling responsibilities should be provided with Personal Computers. Project Management Advisory Services should be responsible for selecting appropriate computer configurations and standardized commercially available preventive maintenance software.
- 5.2 The Project Management Advisory Services Section should provide mentors for the field supervisors to assist them in setting up preventive maintenance inventories, procedures, standards, and formatted reports. These Maintenance Analysts should report to the Area Superintendents.
- 5.3 Management should encourage supervisors with similar responsibilities in the various sections to form maintenance committees to periodically review maintenance procedures, frequencies, time standards, and experience.
- 5.4 The Maintenance Analysts should help supervisors develop exception reports indicating equipment not maintained on schedule. These exception reports should go to the Area Superintendents with summaries to Division Management.
- 5.5 The Project Management Advisory Section should be provided with sufficient additional staff to provide the technical support and coordination required by the field supervisors.
- 5.6 Preventive maintenance should not be allowed to be deferred for the sake of new construction. Management must be willing to either add staff or seek short term contract labor to handle the overloads.
- 5.7 Discrete work order numbers should be established to capture and isolate maintenance costs and man-hours by type of facility, location and crew. Stricter control over time charging should be implemented.
- 5.8 Project Management Advisory Services should commence planning for a long-term unified maintenance management program.

POWER OPERATIONS

- 6.1 Organizationally separate the power operational responsibilities from the planning responsibilities. This restructure should be conducted with a view toward the implementation of the current program to automate the control and data collection of the water and electric systems.
- 6.2 The Systems Operations Center should be elevated within the Division structure to a position commensurate with its responsibilities.
- 6.3 Standards should be developed directing a common approach to the various levels of maintenance at the small hydro stations.
- 6.4 A regular long-range planning program for small hydro operations should be instituted. We believe that a planning horizon of at least five years is appropriate.

FIRST RESPONDERS

- 8.1 The District should modify its planned four-person off-shift crew complement to include a water treatment plant certified operator as Shift Supervisor with responsibility for overseeing all activities (operations and maintenance) on the site during his watch.

TRAINING

- 10.1 Management should clearly state its commitment to training. The management team should develop a set of training goals and objectives which are both implementable and measurable.
- 10.2 Division management should develop a curriculum of training for the various classifications including technical and non-technical subjects which meet not only legal and regulatory requirements but are designed to improve the capabilities of the employees and their commitment to the District.
- 10.3 To the extent possible training should be conducted by Division personnel.
- 10.4 Coordination of all training of Operations Division personnel should be centralized in the Operations Technical Services Section. Outside divisions should arrange for training of Operations Division personnel through the Operations Technical Services Section.
- 10.5 The Operations Technical Services Section should be responsible for maintaining the training records of Operations Division personnel.

- 10.6 Time spent training should be captured on appropriate work orders so that it can be isolated and reported to Division management.
- 10.7 Division management should work with the Personnel Division to minimize the problems related to notification of field personnel about classes being offered during working hours which work units available within the Division are unable to accommodate.
- 10.8 Staffing in the Operations Technical Services Section should be increased to accomplish the above recommendations.
- 10.9 Personnel from various field disciplines should be temporarily assigned to the Operations Technical Services Section to develop training programs and manuals in those areas determined to be necessary.

HUMAN RESOURCES

- 11.1 The District should conduct a Classification Evaluation Study for all management and employee positions.
- 11.2 Review supervisory span of control in each section. Where required, merge units with like duties under a single supervisor, or split units where too wide a span of control may have adverse impacts on job performance or safety.
- 11.3 Management should immediately set up a succession management program.

INFORMATION SYSTEMS

- 12.1 There should be explicit participation of Operation Division personnel in the identification of information needs, determination of solution specifications and resource deployments, and prioritization of implementation projects.
- 12.2 Standards for PC equipment and software should be updated to reflect industry trends toward easy-to-use graphical interfaces that support functional integration of software products from multiple vendors.
- 12.3 Procedures for requesting PC equipment and software should be streamlined.
- 12.4 Information Systems and PC Support staff should visit field locations more frequently to learn firsthand about requirements for information and training. Attention should be focused on assisting staff to use computers for improving quality and productivity.

- 12.5 The Operations Division should seek out opportunities for gaining major productivity improvements by implementing relatively small information systems projects.
- 12.6 Plant drawings should be maintained in electronic form to facilitate access by the Division and rapid update to reflect engineering changes and new construction.
- 12.7 Use of electronic mail should be expanded through short, intensive training and familiarization sessions.
- 12.8 The replacement of existing older System Control and Data Acquisition (SCADA) systems with standardized, vendor-independent software should be given a high priority. Proposed electronic sensors on revenue meters should be seriously considered. Long-range plans for SCADA development should be more broadly communicated and clearly coordinated with other District information systems plans.
- 12.9 The Division should consider initiating a high-priority project to exploit IS technology to help deal with concern in the field regarding timely communication of new environmental regulations and the redesign of maintenance procedures to ensure compliance.
- 12.10 Technical standards developed for office computers are inappropriately applied to requests for laboratory instrumentation computers. A separate authorization process for instrumentation computers should be set up to eliminate this unproductive bottleneck.

IMPACT OF NEW REGULATIONS

- 13.1 Key Operations Division personnel should be involved in developing action programs for addressing water quality regulations.
- 13.2 Programs for additional training of Operations Division personnel will be essential to implementing the increasingly complex water quality regulations.
- 13.3 A Water Quality engineer should be stationed at each of the water treatment plants.
- 13.4 Management should clearly communicate its water quality objectives and define the division of responsibilities between Water Quality and Operations to meet these objectives.
- 13.5 MWD should carefully reassess and possibly accelerate its source development and treatment plant capital programs.