Section 17
Recommendations and Conclusions

The general objective of this master plan was to produce a dynamic document that defines an integral strategy for the provision of water and wastewater services in the study area for the next 20 years. Through the implementation of this strategy CESPT will contribute toward improving public health, quality of life, and environmental protection for current and future generations. The main recommendations and conclusions of the master plan are presented in this section.

17.1 Recommendations

Twelve water and wastewater alternatives were developed and evaluated as part of the master plan. Several planning assumptions and considerations were made for the development of alternatives. For example, it was assumed that the expansion of the existing South Bay International Wastewater Treatment could not be recommended, even though this option might be technically feasible, provided a bi-national agreement is reached. The base planning year was 2001, and the planning periods were 2008, 2013 and 2023. Additionally, the year 2040 was used for the planning of aqueducts.

Similarly, it is assumed that the following infrastructure will continue operating or will be constructed and will operate during the planning period, provided an adequate maintenance program is in place:

- Tijuana Sana (wastewater system rehabilitation)
- Japanese Credit projects (four wastewater treatment plants)
- Rosarito 2 potable water system
- Extraction from the Tijuana River aqueduct
- Expansion of the Colorado River aqueduct capacity by 1.3 m^3/s
- Water loss reduction and control program
- Delivery of water from the United States through the emergency connection for the short term
- Rehabilitation and expansion of the San Antonio de los Buenos wastewater treatment plant

The evaluation of the 12 alternatives was based on the following 8 criteria, which reflect the objectives established by CESPT:

- Total annual cost (annualized capital and operation and maintenance cost)

- Level of environmental impact
- Level of risk of implementation
- Contribution of the largest source of water as a percentage of total supply
- Ratio of groundwater extracted over artificial aquifer recharge
- Reduction in the volume of wastewater discharged to transboundary waters
- Efficient sludge management
- Percentage of effluent being reused

The comparison of alternatives based on these criteria indicate that Alternatives F-E, G-E and F-B most consistently meet the objectives of the master plan. Alternative F-E obtained the highest score due to the contribution of each of the master plan objectives. However, Alternatives G-E and F-B also obtain high scores when all criteria are taken into consideration.

Alternatives F-E and F-B entail the construction of a desalination facility and the implementation of an indirect potable reuse program. Alternative G-E includes these two new sources, as well as the construction of a new Colorado River aqueduct.

For the wastewater system these three alternatives include the construction of a new regional wastewater treatment plant in the area of the Alamar River. However, Alternatives F-E and G-E include the expansion of La Morita plant, thus reducing the capacity needed for the Alamar regional plant.

The cost and the diversity of waster sources are two of the most important evaluation criteria for CESPT, and the results of the evaluation show that Alternatives F-E, F-B and G-E have important advantages for these two criteria.

The analysis of the contribution of each criterion toward the overall score indicates important similarities among the three alternatives. Due to this reason, even though Alternative F-E has the highest ranking, its implementation in phases would be compatible with a future implementation of Alternatives F-B and G-E. For example, if the construction of a Colorado aqueduct becomes convenient in the future, Alternative F-E would become Alternative G-E. Similarly, if the first phase of the Alamar Regional wastewater treatment plant is constructed as a first phase of Alternative F-E, and it is decided to expand La Morita in the future, Alternative F-B will result.

Some of the most important conclusions of these analyses are:

- Wastewater Alternatives B and E meet the master plan objectives in the most consistent manner, and it is remarkable that these alternatives are very similar to each other. The only difference between Alternatives B and E is the expansion of the La Morita plant under Alternative E. These alternatives could have a similar, or even identical, first implementation phase.

- Seawater desalination is an option that should be implemented, and thus should be considered as a short-term option, as it has significant advantages.

- Indirect potable reuse components on the other hand, should be evaluated for a later implementation, since their costs and implementation risks are higher than desalination.

- The feasibility of constructing a new Colorado River aqueduct should continue being analyzed. Alternative G-E, which includes the construction of a new aqueduct, has the second highest ranking to meet the objectives of CESPT.

Alternative F-E is the alternative that best meets CESPT objectives, and as such, it is used as a base for the development of the capital improvements program.

Analysis of the Implementation of the United States Public Law 106-457

Public Law 106-457 of the United States creates the possibility for the construction of a wastewater treatment plant in Mexico to treat to a secondary level primary effluent from the International Plant, as well as raw wastewater generated in Mexico. Potentially, U.S. funding could be available for the construction and operation of the plant.

The master plan does not evaluate the feasibility, nor the advantages and disadvantages of the construction of the Public Law plant. Nonetheless, the way in which the plant could be constructed as part of any of the three highest-ranking alternatives was evaluated.

The law indicates that the plant could have a capacity of up to 75 mgd (3,285 l/s), as long as the master plan determines that such capacity is necessary. Otherwise, the plant would have a capacity of 50 mgd (2,190 l/s), of which 25 mgd (1,090 l/s) would be used to treat advanced primary effluent from the International Plant.

The master plan determined that an additional 1,470 l/s of treatment capacity are required to treat flows generated in the Tijuana River watershed through the year 2023, in addition to the 1,100 l/s of advanced primary effluent from the International Plant. Thus, the total capacity of the International Plant should be 2,560 l/s (59 mgd). This capacity would be required to meet needs through the year 2023, which is the

planning period used for the master plan. The Public Law plant could be expanded after the year 2023 to treat additional flows generated after that year.

The Public Law plant can be constructed under any of the three highest-ranking alternatives (F-E, G-E, and F-B).

Effluent Disposal Options

Several effluent disposal options were evaluated as part of the master plan. The cost estimates for the alternatives include effluent lines from the La Morita and Monte de los Olivos plants to the border along the Tijuana River. Similarly, the costs include an effluent line from the plant in the Alamar area to the border for the alternatives that include this plant.

Once the effluent is conveyed by gravity to the border, there are three possibilities for its conveyance to the ocean:

1. Connect the effluent line to the South Bay ocean outfall for disposal in the United States

2. Convey the effluent from the border to a point in the vicinity of the existing discharge point from the San Antonio de los Buenos plant by means of a force main

3. Convey the effluent from the border to a point in the vicinity of the existing discharge point from the San Antonio de los Buenos plant by means of a tunnel by gravity

For the discharge options in Mexico, once the effluent is conveyed to the coast it can be discharged to the ocean through an ocean outfall or directly at the shore.

After a preliminary consultation with United States agencies regarding the feasibility of using the South Bay Ocean Outfall, it was decided to evaluate the alternatives based on this discharge option, as this appears preliminarily to be a feasible option. Nonetheless, the implementation of this option would require negotiations toward an agreement for the use of the outfall, as well as guarantees toward the implementation of an industrial and commercial discharge control program.

Three important reasons for the selection of this discharge option include:

- The fact that the infrastructure is already in place and has sufficient capacity to handle additional flows.

- Conveyance options in Mexico are technically complex and require significant infrastructure (for both tunnel and forcemain options), making this option difficult to implement in the short term.

- Capital and operation and maintenance costs are higher for the two discharge options in Mexico.

CESPT should give a high priority to determining the feasibility of each of this options, considering the imminent need to dispose of effluent in the near future once the Japanese Credits plants are in line. The analyses conducted as part of the transboundary environmental assessment indicate that increasing discharge flows at the South Bay ocean outfall will not result in significant impacts.

Common Elements to All Alternatives
All the alternatives developed in the master plan have a series of common elements, which include:

- Expansion of the existing water distribution and wastewater collection infrastructure
- Cleaning, inspection, and rehabilitation of sewer lines
- Rehabilitation of water distribution lines and leak reduction
- Program for the connection of new users
- Industrial and commercial discharge control program
- Evaluation and rehabilitation of pumping stations
- Program for the control of sanitary installations
- Separation of storm and sanitary sewers
- Septage collection program
- Improvements to the operation and maintenance of wastewater treatment plants
- Non-potable water reuse program (industrial, landscaping)
- Sludge management study (including reuse)
- Ocean discharge beyond the surf
- Aquifer recharge study
- Optimization study for water treatment plants
- Management study for the Abelardo L. Rodríguez reservoir
- SCADA

- Rate study
- Increasing metering efficiency

Prioritization of investments
A preliminary prioritization of investments is presented in Section 14.2, along with other recommendation included as part of Alternative F-E, as described below.

Agua Potable
It is recommended that the planning activities performed to date be complemented with further more detailed planning work aimed at the construction of a desalination plant. To this end, CESPT should establish communications with potential funding agencies, such as the Border Environment Cooperation Commission (BECC) and the North American Development Bank to explore the possibility of obtaining low-interest or grant funding for the construction of the plant. Furthermore, ESPT should evaluate the possibility of implementing the desalination plant under a private participation arrangement.

CESPT should undertake detailed financial and rate studies indicating the modifications to the rate structure and the utility's efficiency that would be required to guarantee the financial sustainability of the project, specially considering it significant construction and operation and maintenance costs. CESPT must ensure that there is at all times enough revenue stream to cover operation and maintenance costs and debt obligations.

In addition, it is recommended that CESPT initiate detailed feasibility studies for the indirect potable reuse program. Furthermore, the feasibility of implementing a non-potable reuse program aimed at reducing water demand should be assessed, even though this option will not represent a new water source per se.

Even though Alternative F-E does not include the construction of a new Colorado River aqueduct, it is recommended that CESPT continue evaluating its feasibility, since this option may be convenient given the right conditions, such as reaching an agreement with the United States for the construction of a bi-national aqueduct. Moreover, the additional use of the Colorado River may be favored if the detailed studies of the local aquifers as they relate to indirect potable reuse indicate a low level of feasibility.

Finally, CESPT should continue expanding its water and wastewater coverage in order to reduce risks to public health resulting from insufficient supply and the consumption of low quality water. Similarly, CESPT must continue and even increase its line rehabilitation program to eliminate illicit water connections and reduce physical and commercial losses.

The implementation of these recommendations will require several institutional strengthening actions as a result of their high cost and the level of complexity of some of the proposed technologies. Even though CESPT has been increasing its physical and commercial efficiency over the last several years, partly as a result of the certification and funding process of the BECC and NADB, it is recommended that the utility continue implementing institutional strengthening actions. The coverage of the metering program should be expanded to include 100 percent of the users, and the meter calibration, repair and replacement program should continue, especially for large users. An efficient metering program would improve the revenue stream and would promote water conservation. Finally, the water conservation action described in Section 6.5 should be implemented.

Wastewater System

As previously mentioned, the cost estimates presented in Section 12 are based on the assumption that the South Bay ocean outfall can be used for the disposal of secondary effluent from the treatment plants located in Mexico to the Pacific Ocean in the United States. However, it is important for CESPT to establish communications with the appropriate agencies in both countries to ensure that the use of the outfall will be allowed. Similarly, it was assumed that there will be no fees for the use of the outfall, either for operation and maintenance or for capacity. This assumption should also be discussed with the appropriate agencies.

In addition to the construction of the 4 wastewater treatment plants to be constructed under the Japanese Credit and the plants proposed by the master plan, the appropriate sanitation of Tijuana and Playas de Rosarito will require adequate wastewater collection and conveyance. To this end, CESPT must continue expanding the sewer system to areas that currently lack this service, as well as continuing rehabilitating lines in poor conditions as envisioned under the second phase of the Tijuana Sana rehabilitation program.

As previously mentioned, United States Public Law 106-457 creates the possibility of obtaining U.S. funding for the construction of a wastewater treatment plant in Tijuana to treat wastewater generated in Mexico. The construction of this plant would be compatible with any of the three highest-ranking alternatives. CESPT should continue exploring the possibility of constructing this plant.

17.2 Conclusions

Current and future conditions of the municipalities of Tijuana and Playas de Rosarito were evaluated as part of the master plan, and water and wastewater alternatives aimed at satisfying needs through the year 2023 were developed and evaluated. A 20-year capital improvements program was developed.

The implementation of the recommended actions will encounter important technical, environmental, financial and institutional challenges. Overcoming these challenges will require strong leadership by CESPT, in close coordination with regulatory

agencies, bi-national agencies, and potential funding sources. Similarly, a close relationship with U.S. agencies, notably the City of San Diego and U.S. EPA is recommended. This type of bi-national cooperation has already shown results in several programs such as Tijuana Sana, Parallel Line, and the rehabilitation of the San Antonio de los Buenos WWTP. Bi-national cooperation allows for the exchange of know-how and experiences, promotes a good neighborhood climate, and creates the potential for U.S. funding of some projects.

The high construction, operation and maintenance costs would require innovative financial schemes. In the past, the BECC and NADB programs have been successful in developing, financing, and implementing projects, and it is recommended that these programs be explored. Similarly, CESPT should assess the feasibility of private participation, which could help reduce the need for CESPT to contribute significant financial resources upfront.

The highest ranking Alternative (Alternative F-E), which includes the construction of a new desalination plant, the implementation of an indirect potable reuse program, and the construction of a regional wastewater treatment plant in the area of the Alamar River may be implemented in phases. This phased implementation will allow the CESPT to postpone some investments and will provide flexibility for the incorporation of some elements of other alternatives that may be convenient in the future.

The master plan recommendations are not limited to the construction of infrastructure, but also include a series of institutional strengthening activities, which range from public education campaigns, detailed rate studies, expansion of water distribution and sewer coverage, and improving the commercial efficiency of the utility.

The master plan document must be dynamic and be updated periodically, and may be used to measure CESPT achievements.