ES.1 PROJECT BACKGROUND

The West Basin Municipal Water District’s (West Basin) service area encompasses approximately 185 square miles in southwest Los Angeles County. The West Basin service area, shown on Figure ES.1, includes 17 cities and unincorporated areas of Los Angeles County, and serves a population of about one million.

As of 2007, West Basin wholesaled approximately 220,000 acre-feet per year (afy) or 196 million gallons per day (mgd) of imported potable water to its customers within the service area. In addition, West Basin served about 31,861 afy or 28 mgd of recycled water to over 200 customer sites within the service area for landscape irrigation, industrial applications, and seawater intrusion barrier applications.

West Basin is planning to expand its recycled water system to continue offsetting potable water demands in its service area and improve overall water supply reliability by reducing dependency on less reliable imported water supplies.

Major capital investments are required to expand and maintain West Basin’s recycled water system to meet expected needs and establish reliable recycled water supply for existing and new recycled water customers through year 2030. To define and prioritize the capital improvement projects needed to achieve this goal, West Basin retained Carollo Engineers (Carollo) and team members AKM Consulting Engineers, SPI Technologies, and E.W. Moon, to develop this Capital Implementation Master Plan (CIMP) for recycled water systems.

In addition, West Basin is currently preparing its long-term financial plan that includes a forecast of expenditures for future expansions, repair, replacement, and rehabilitation requirements, and operation and maintenance of the overall recycled water system required to serve approximately 70,000 acre-ft/yr of recycled water by year 2020. This CIMP and the long term financial plan will provide a roadmap for West Basin to achieve its mission of providing reliable water supplies to its customers and the southern California region, increasing recycled water usage and lessening dependency on imported water supplies.
ES.2 EXISTING RECYCLED WATER SYSTEM

West Basin currently delivers about 31,860 afy of recycled water to over 200 recycled water customer sites. These customers include oil refineries, other industrial facilities, commercial buildings, golf courses, parks, school districts, Caltrans, and the Water Replenishment District of Southern California. West Basin receives secondary effluent from the City of Los Angeles’ Hyperion Wastewater Treatment Plant (HWWTP) as a source water to produce five different recycled water quality levels, also referred to as “designer water”, at four recycled water facilities. These five designer water types are:

- Title 22 Water
- Barrier Water (Softened Reverse Osmosis [RO])
- Industrial RO
- Industrial RO Ultra
- Nitrified Water

West Basin distributes this designer water through different networks of conveyance systems to its customers. The four treatment plants and designer water types are listed in Table ES.1.

<table>
<thead>
<tr>
<th>Table ES.1 Designer Water Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Implementation Master Plan</td>
</tr>
<tr>
<td>West Basin Municipal Water District</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment Plant</th>
<th>Source Water</th>
<th>Designer (Product) Water Types</th>
<th>Capacity (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edward C. Little Water Recycling Facility (ELWRF)</td>
<td>Secondary Effluent from HWWTP</td>
<td>Title 22 (T22)</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barrier Water (MF/RO/UV)</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial RO (single pass)</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial RO Ultra (double pass)</td>
<td>2.6</td>
</tr>
<tr>
<td>Chevron Nitrification Facility (CNF)</td>
<td>T22 from ELWRF</td>
<td>Nitrified Water</td>
<td>4.9</td>
</tr>
<tr>
<td>ExxonMobil Water Recycling Facility (EWRF)</td>
<td>T22 from ELWRF</td>
<td>Nitrified Water</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial RO (Single Pass)</td>
<td>3.2</td>
</tr>
<tr>
<td>Carson Regional Water Recycling Facility (CRWRF)</td>
<td>T22 from ELWRF</td>
<td>Nitrified Water</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial RO (Single Pass)</td>
<td>5.0</td>
</tr>
</tbody>
</table>
The five different designer water types are conveyed through various networks of nearly 100 miles of recycled water distribution pipelines ranging in diameter from 4 to 60 inches. The existing distribution systems consist of ten subsystems that were categorized by West Basin, depending on specific industrial customer location and “designer water” conveyance system, location of the treatment system, and waste discharge system. The ten existing subsystems are:

- Hyperion Secondary Effluent Pumping System (HSEPS)
- Title 22 Distribution System
- West Coast Barrier Water System
- Chevron Low Pressure Boiler Feed (LPBF) System (Industrial RO Water)
- Chevron High Pressure Boiler Feed (HPBF) System (Industrial RO Ultra Water)
- Chevron Nitrified Water System
- Carson Regional Water Recycling Facility (CRWRF) Brine Line
- Edward C. Little Water Recycling Facility (ELWRF) Brine Line
- bp Reverse Osmosis System (Industrial RO Water)
- bp Nitrified Water System

These distribution systems and location of the West Basin’s treatment facilities are shown on Figure ES.2. Characteristics for each subsystem are summarized in Table ES.2, while a detailed description of each subsystem is provided in Chapter 2 of this CIMP.

<table>
<thead>
<tr>
<th>System Name</th>
<th>Distribution System</th>
<th>Other Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSEPS</td>
<td>3 mi (48”-60”)</td>
<td>PS: 51 mgd</td>
</tr>
<tr>
<td>Title 22</td>
<td>78 mi (4”-60”)</td>
<td>Storage: 10 MG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tank 1 PS: 25 mgd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tank 2 PS: 26 mgd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diversion PS: 18 mgd</td>
</tr>
<tr>
<td>West Coast Barrier Water</td>
<td>1 mi (30”)</td>
<td>Storage: 0.5 MG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS : 15 mgd</td>
</tr>
<tr>
<td>Chevron LPBF</td>
<td>2 mi (10”-12”)</td>
<td>PS : 3 mgd</td>
</tr>
<tr>
<td>Chevron HPBF</td>
<td>2 mi (12”-16”)</td>
<td>PS : 3 mgd</td>
</tr>
</tbody>
</table>
Table ES.2  Existing Recycled Water Systems Summary  
Capital Implementation Master Plan  
West Basin Municipal Water District  

<table>
<thead>
<tr>
<th>System Name</th>
<th>Distribution System(1)</th>
<th>Other Facilities(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chevron Nitrified</td>
<td>0.5 mi (20&quot;)</td>
<td>PS : 5 mgd storage</td>
</tr>
<tr>
<td>CRWRF Brine Line</td>
<td>5 mi (14&quot;)</td>
<td>none</td>
</tr>
<tr>
<td>ELWRF Brine Line</td>
<td>3 mi (18&quot;)</td>
<td>none</td>
</tr>
<tr>
<td>bp Reverse Osmosis</td>
<td>1 mi (24&quot;-30&quot;)</td>
<td>PS: 5 mgd</td>
</tr>
<tr>
<td>bp Nitrified</td>
<td>1 mi (12&quot;)</td>
<td>PS: 1 mgd</td>
</tr>
</tbody>
</table>

Notes:  
(1) Approximate Length.  
(2) Pumping station (PS) capacities refer to firm capacity (excluding the largest pump unit)

ES.3  RECYCLED WATER DEMANDS  

ES.3.1  Existing Demands  

West Basin currently serves 175 recycled water customers at more than 200 customer sites that can be categorized into four usage types: industrial, irrigation, mixed use, and barrier customers. Mixed use refers to customers that use recycled water for more than one usage type (e.g., irrigation and cooling tower applications). The existing customer demands by usage type are listed in Table ES.3.

<table>
<thead>
<tr>
<th>Customer Type</th>
<th>Usage Type Code</th>
<th>Number of Customers</th>
<th>Existing Demand(1) (afy)</th>
<th>Percent of Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier</td>
<td>B</td>
<td>1</td>
<td>11,380</td>
<td>36</td>
</tr>
<tr>
<td>Industrial</td>
<td>IN</td>
<td>5</td>
<td>17,018</td>
<td>53</td>
</tr>
<tr>
<td>Irrigation</td>
<td>IR</td>
<td>165</td>
<td>3,257</td>
<td>10</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>MU</td>
<td>4</td>
<td>205</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Total       175         31,860           100           

Note:  
(1) Demand of 31,860 afy is based on the average usage obtained from historical billing records as presented in Table 3.2. The 2007 recycled water sales were 32,200 afy.
Legend:
- Treatment Facility
- Source Location
- Major Customer
- Seawater Barrier
- Barrier Blend Stations
- Disinfection Stations
- US Highway
- State Highway
- Streets
- Pipelines (by Diameter):
  - 12" and smaller
  - 14" through 30"
  - 36" and larger

Figure ES.2
Existing Distribution Systems and Facilities

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems
As listed in Table ES.3 and shown on Figure ES.3, the industrial usage accounts for the majority of the existing system recycled water demand, while irrigation usage accounts for the majority of customers. Therefore, the industrial demands present a significant portion of overall recycled water demand and provide a solid baseline of usage within the West Basin’s customer base. A complete list of all existing customers and their respective usage type, demand, and peaking factors are provided in Chapter 3, while detailed location maps of all customers are included in Appendix B.

**Figure ES.3**
Existing Demand by User Type

<table>
<thead>
<tr>
<th>Usage Type</th>
<th>Percentage</th>
<th>Demand (afy)</th>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>53%</td>
<td>17,018</td>
<td>5</td>
</tr>
<tr>
<td>Barrier</td>
<td>36%</td>
<td>11,380</td>
<td>1</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>&lt;1%</td>
<td>205</td>
<td>4</td>
</tr>
<tr>
<td>Irrigation</td>
<td>10%</td>
<td>3,258</td>
<td>165</td>
</tr>
</tbody>
</table>

**ES.3.2 Potential Demands**

A list of 120 potential customers with their associated demands and peaking factors was compiled. Detailed information for each of these potential customers is included in Chapter 3, while detailed location maps are included in Appendix B. The total estimated demand of potential customers anticipated to be connected by 2020 is approximately 26,400 afy. The distribution of the recycled water demands by usage type is shown on Figure ES.4. The total estimated demand of all potential customers (through 2030) is approximately 36,000 afy and is shown on Figure ES.5.
Figure ES.4
Demand Distribution Through 2020 by User Type

- **Industrial** (59%)
  - 43,522 afy
  - 20 customers

- **Irrigation** (11%)
  - 6,766 afy
  - 266 customers

- **Mixed Use** (<1%)
  - 305 afy
  - 5 customers

- **Barrier** (29%)
  - 16,980 afy
  - 1 location

Figure ES.5
Demand Distribution Through 2030 by User Type

- **Industrial** (60%)
  - 49,222 afy
  - 21 customers

- **Irrigation** (15%)
  - 12,266 afy
  - 268 customers

- **Mixed Use** (<1%)
  - 305 afy
  - 5 customers

- **Barrier** (25%)
  - 20,480 afy
  - 2 locations
As shown on Figure ES.4 and Figure ES.5, industrial usage represents the majority of the total demand with approximately 59 percent of the potential demand of customers anticipated by 2020 and 60 percent of the potential demand of all potential customers.

**ES.3.3 Future Demands**

The recycled water demands are projected to increase from 31,860 afy to 82,273 afy, which equates to an average demand increase of about 4 percent per year through year 2030. This projection is based on the assumption that all potential customers are connected to the future system expansion and use the estimated recycled water demands.

A breakdown of recycled water demands with respect to West Basin’s service area for the existing system, year 2020 demand projection, and year 2030 demand projection are presented on Figure ES.6.

As shown on Figure ES.6, the demand of the customers located outside West Basin’s service area is anticipated to increase from 6,824 afy (21 percent of the total demand) to 16,711 afy (25 percent of the total demand) in 2020. The projected average annual
demand (AAD) is summarized in Table ES.4. This table shows that the year 2020 demand is estimated at 67,575 afy or 60 mgd. When the seasonal peaking factors are applied, the estimated maximum month demand (MMD) is 82 mgd. It should be noted that the MMD is assumed to be the same as the maximum day demand (MDD) as the MDD of large customers typically does not coincide with each other as discussed in detail in Chapter 3.

<table>
<thead>
<tr>
<th>Usage Type</th>
<th>2008 AAD (afy)</th>
<th>2008 MMD (mgd)</th>
<th>2010 AAD (afy)</th>
<th>2010 MMD (mgd)</th>
<th>2020 AAD (afy)</th>
<th>2020 MMD (mgd)</th>
<th>2030 AAD (afy)</th>
<th>2030 MMD (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>3,257</td>
<td>7.6</td>
<td>4,178</td>
<td>9.1</td>
<td>6,766</td>
<td>14.8</td>
<td>12,266</td>
<td>27.1</td>
</tr>
<tr>
<td>Industrial</td>
<td>17,018</td>
<td>20.2</td>
<td>17,488</td>
<td>20.7</td>
<td>43,522</td>
<td>51.4</td>
<td>49,222</td>
<td>58.6</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>205</td>
<td>0.4</td>
<td>205</td>
<td>0.4</td>
<td>305</td>
<td>0.6</td>
<td>305</td>
<td>0.6</td>
</tr>
<tr>
<td>Barrier</td>
<td>11,380</td>
<td>10.2</td>
<td>11,380</td>
<td>10.2</td>
<td>16,980</td>
<td>15.2</td>
<td>20,480</td>
<td>18.3</td>
</tr>
<tr>
<td>Total</td>
<td>31,860</td>
<td>38.4</td>
<td>33,251</td>
<td>40.4</td>
<td>67,573</td>
<td>82.0</td>
<td>82,273</td>
<td>104.5</td>
</tr>
</tbody>
</table>

The City of Los Angeles’ Hyperion Wastewater Treatment Plant (HWWTP) is currently the sole source of supply for West Basin’s treatment facilities and recycled water systems. The HWWTP has a maximum design flow of 550 mgd and a minimum design flow of 160 mgd. The maximum and minimum monthly flows recorded in 2007 were 471 mgd and 299 mgd, respectively. As recycled water demands are typically high during the nighttime, when wastewater flows are low, the minimum hourly flow needs to be considered when sizing storage facilities. The minimum hourly flow in 2007 was about 95,800 gpm (equivalent to 138 mgd).

In 2007, West Basin received on average 32.4 mgd or 36,300 afy from HWWTP, with a maximum day supply of 40.5 mgd. It should be noted that the historical supplies exceed the historical demands due to system losses during treatment and conveyance. Based on field data collected during the model calibration effort, it was estimated that the system demand is approximately 81 percent of the amount of recycled water supplied in the same time period. Therefore, it is assumed that the future supply needs will be 125 percent of the future demand.
West Basin does not currently operate any source equalization facilities to accommodate daily peaking in source supplies. Flow equalization storage is not currently necessary due to the significantly larger source of supply available at the HWWTP compared to the existing demands. Even the minimum flows observed in daily flow patterns (138 mgd) at the HWWTP exceed West Basin’s current maximum pumping capacity of 51 mgd at the Hyperion Secondary Effluent Pump Station (HSEPS). If demand for the secondary effluent (SE) from HWWTP by West Basin and/or other agencies increases significantly in the future, flow equalization storage facilities may have to be considered to meet the future recycled water demands.

West Basin owns the following four treatment facilities:

- Edward C. Little Water Recycling Facility (ELWRF)
- Carson Regional Water Recycling Facility (CRWRF)
- Chevron Nitrification Facility (CNF)
- ExxonMobil Water Recycling Facility (EMWRF)

The locations of these facilities are shown on Figure ES.2.

ELWRF is the only treatment facility that receives supply from the HWWTP. The remaining satellite facilities rely on Title 22 recycled water from ELWRF as a supply source. The existing treatment capacities of these facilities, along with expansions anticipated within near-term, are summarized in Table ES.5.

| Table ES.5 | Treatment Facility Capacities |
| Capital Implementation Master Plan | West Basin Municipal Water District |
| Existing Capacity (mgd) | Near-Term Expansion (mgd) | Near-Term Capacity (mgd) | Expansion Phase |
| ELWRF | 56.8 | 6.5 | 63.3 | Phase V |
| CRWRF | 6.0 | 17.0 | 23.0 | Phase II |
| CNF | 4.9 | 1.5 | 6.4 | Phase Va |
| EMWRF | 8.1 | - | 8.1 | - |

As shown in Table ES.5, West Basin is currently planning the expansion of three of its treatment facilities to accommodate increasing demands. These expansion efforts are the ELWRF Phase V Expansion Project, CRWRF Phase II Expansion Project, and the expansion of the CNF (also referred to as ELWRF Phase Va).
HSEPS currently has the capacity to pump 51.0 mgd (57,100 afy) of SE from HWWTP. On average, the HSEPS conveys a flow of 33 mgd, with maximum day supplies of up to 40.5 mgd. To accommodate projected demand increases, additional pumping capacity will need to be added to the HSEPS between fiscal year (FY) 2010/2011 and FY2014/2015.

Projected supply requirements, using a recovery ratio of 80 percent and maximum month demands, are presented on Figure ES.8. West Basin’s existing firm pumping capacity of 51.0 mgd is sufficient to meet average annual demands through FY2009/10. However, a supply shortfall to meet the projected maximum month demand is expected to occur following year 2010. Therefore, West Basin will be required to increase supply capacity from HWWTP and/or develop a new source of supply to accommodate new customers. The addition of new customers is therefore dependent upon West Basin’s ability to increase the supply capacity from HSEPS and/or the development of a new supply source. A detailed projection by calendar year for the HSEPS firm capacity requirements is presented on Figure ES.9.

![Figure ES.8](image-url)

**Figure ES.8**
Projected Maximum Month Supply Requirements

- **Potential Demand**
- **Required Supplies**
- **Existing Supply Capacity**

Supply Requirement (mgd)

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>38.4</td>
<td>40.4</td>
<td>82.0</td>
<td>104.5</td>
</tr>
<tr>
<td></td>
<td>48.0</td>
<td>50.5</td>
<td>102.5</td>
<td>130.6</td>
</tr>
</tbody>
</table>

Existing Firm Supply Capacity 57,120 afy (51 mgd)
To provide redundancy and reliability in supply of recycled water to existing and potential new customers, a potential new supply source has been identified. This new supply source is the Los Angeles County Sanitation District’s (LACSD) Joint Water Pollution Control Plant (JWPCP), which is located about 4 miles southwest of the West Basin’s CRWRF as shown on Figure ES.10.

The JWPCP treats on average approximately 300 mgd to secondary effluent standards. Since JWPCP treats only to secondary effluent quality, additional advanced treatment processes and conveyance systems would be required to meet specific West Basin customer demands.

The use of LACSD’s JWPCP as a water supply source was evaluated to determine feasibility and potential capital impacts. Three supply source options were considered although there could be several additional alternative ways of utilizing this identified new source.
Figure ES.10
Potential Sources of Supply

Legend

Pipelines (by Diameter)
- 12" and smaller
- 14" through 30"
- 36" and larger

Seawater Barrier

Water Purveyor Service Areas (with Recycled Water Distribution Systems)
- Central Basin MWD
- Long Beach Water Department
- West Basin MWD

US Highway

State Highway

Streets

Pumping Station

Treatment Facility

LACSD JWPCP

Hyperion WWTP

West Basin Municipal Water District

Central Basin Municipal Water District

Long Beach Water Department

West Basin Municipal Water District Capital Implementation Master Plan For Recycled Water Systems
A comparison of the three supply options is summarized in Table ES.6. In Option 1, all future demands would be supplied from HWWTP, which would require extensive pump station upgrades, parallel pipelines in the HSEPS and Title 22 system to satellite facilities, as well as significant treatment plant expansion at ELWRF. In Option 2, a portion of the future demands is assumed to be supplied from a new treatment plant (NTP) located at the JWPCP. It is assumed that a 26-mgd NTP would provide recycled water to the Dominguez Gap and the bp expansions. In Option 3, this NTP is expanded to a capacity of 49 mgd, and would serve additional customers in the southwest portion of West Basin’s service area.

| Table ES.6 | Comparison of Supply Sources |
| Capital Implementation Master Plan | West Basin Municipal Water District |

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Supply from HWWTP(1)</th>
<th>Supply from JWPCP(1)</th>
<th>Capital Cost(2) ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Supply from Hyperion Only</td>
<td>82,275 afy</td>
<td>0 afy</td>
<td>$666.5</td>
</tr>
<tr>
<td>Option 2</td>
<td>Partial Supplies from JWPCP (26 mgd)</td>
<td>64,684 afy</td>
<td>16,591 afy</td>
<td>$639.0</td>
</tr>
<tr>
<td>Option 3</td>
<td>Maximize Supply from JWPCP (49 mgd)</td>
<td>50,684 afy</td>
<td>31,591 afy</td>
<td>$558.6</td>
</tr>
</tbody>
</table>

Notes:
(1) On an average annual basis. Treatment in comparisons is sized for pre-treatment MMD supply levels. Pump stations in comparisons are sized for peak hour MDD levels.
(2) For relative comparison only. For further details on costs shown in this table, see Chapter 8.

As shown in Table ES.6, it is more cost-effective to utilize the JWPCP as a secondary supply source than to supply all future demands solely from Hyperion. Additional benefits of using a secondary supply source include increased reliability and redundancy, as well as reduced expenditures in retrofitting or constructing large diameter portions of the Title 22 conveyance system for the long distance through the South Bay area.

Based on discussions with West Basin staff it was determined that Option 2 is the most practical and cost effective method for the development of the capital improvement program of this CIMP. However, use of the LACSD supply source should be analyzed in more detail as part of future project planning efforts.
ES.5  RECYCLED WATER SYSTEM EVALUATION

The condition and performance of the recycled water systems were evaluated using three different methodologies:

- Condition Assessment of the four treatment facilities by conducting field visits;
- Hydraulic modeling of the ten different recycled water systems under existing and future demand conditions;
- Modeling of the overall recycled water system including the four treatment facilities on a unit process level.

The condition assessment was used to determine the remaining useful life of equipment as well as repair, replacement, and rehabilitation needs to ensure long term system integrity and reliability. The findings of this condition assessment are included in Appendix F of this report. Cost estimates for the recommended replacement and rehabilitation projects were developed and phased by planning period. These rehabilitation and replacement costs are included the capital improvement program (CIP) as presented in section ES.7.

Ten different hydraulic models were developed using H2OMAP Water and WSPG modeling software to model pressurized distribution systems and gravity conveyance systems, respectively. These models were calibrated and used to evaluate the hydraulic performance of each system under various demand conditions and system configurations. The Title 22 system hydraulic model was also used to evaluate water age in the system. The hydraulic model development and calibration process is described in Chapter 6, while the calibration technical memorandum, covering details of the hydraulic model calibration, is included in Appendix E of this report. Recommendations made to address deficiencies under existing demand conditions and to meet the hydraulic evaluation criteria under future demand conditions are described for each system in Chapters 7 and 8, respectively. These recommendations are included in the CIP as presented in section ES.7.

In addition to the hydraulic models, a customized treatment planning model was developed that incorporated all recycled water systems and the treatment plants to a unit process level. This model, developed in OPTIMO™, was used to conduct flow balancing between the various systems to identify hydraulic restrictions. The model also traces up to 15 water quality parameters and could therefore be used to identify treatment process upgrade needs to meet water quality standards for increased flow conditions and/or comply with more stringent regulations. The treatment model development and calibration process is described in Chapter 8, while the model user manual is included in Appendix H of this report. Recommendations made to address deficiencies to meet the hydraulic criteria under future demand conditions are included in the CIP as presented in section ES.7.
ES.6 SUSTAINABILITY

West Basin’s ongoing sustainability efforts include “green” planning and design of future projects. Where applicable, it is assumed that West Basin projects will be designed for certification in accordance with the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. However, specific decisions to incorporate green building technology will be implemented and refined at the preliminary design level. In addition, life cycle economic analysis of potential green building options should also be investigated at preliminary design levels. Although the current LEED Rating System is generally focused on human occupied structures, there are several general planning and design strategies that West Basin may consider implementing to enhance their sustainability efforts. A few of these strategies are discussed below:

- Water Conservation - Promote water conservation, drip irrigation systems, and xeriscaping with native plants that require minimal irrigation to West Basin’s customers. Implement water conservation practices at all West Basin facilities, including recycled water usage for irrigation and non-potable usage (e.g., toilet flushing).

- Energy Conservation - Specify variable frequency drive (VFD) pumps for energy efficient system operations. Require fleet automobiles or other vehicles to be low emitting or fuel efficient vehicles (e.g., electric or solar powered).

- Renewable Energy Production - Implement solar/wind power production. For example, specify the installation of solar panels on roofs of new treatment and storage facilities.

- Materials Reuse - Salvage equipment or materials that have adequate remaining useful life that can be reused locally, thereby reducing landfill wastes.

- Carbon Footprint - Include carbon footprint calculations for selected projects (e.g., long pipelines that require significant amounts of material resources) and consider carbon footprint in construction material specifications.

- LEED Certified Design - Specify LEED certification requirements for selected projects, especially facilities with a high public visibility and/or public outreach and education component.
ES.7 CAPITAL IMPROVEMENT PROGRAM

The CIP summarizes the recommended improvements, cost estimates, and project cost allocated to specific programs and for the recommended improvements to the distribution systems. The CIP also establishes phasing of projects through the planning horizon. The purpose of this CIP is to provide West Basin with a guideline for the planning and budgeting of future improvements of its distribution systems and facilities.

A detailed CIP is described in Chapter 9 of this report and includes three subsections that present the recommended projects in different ways. These are:

- Summary of recommended projects by system
- Phasing of recommended projects by planning period
- Summary of entire CIP cost by planning year and facility type

All capital costs presented in this chapter are based on 2009 dollars and include construction cost, construction cost contingency and markups for engineering, design, project administration, construction management, and public outreach.

ES.7.1 CIP by System

All recommended projects are listed by system in Section 9.1. These systems include the ten different recycled water distribution systems and five treatment facilities (four existing and one future facility). The estimated project costs through 2020 for each system are summarized in Table ES.7.

As shown in Table ES.7, the total capital cost for all facilities through 2020 is estimated at approximately $615 million (M). A significant portion of the total CIP costs are contributed by five of the 15 systems, the T22, BPN, BPRO, CRWRF, and ELWRF, which accounts for about 60 percent of the total CIP.

ES.7.2 CIP by Planning Period

The CIP is divided into nine (9) different planning periods, six 1-year periods from fiscal year (FY) 2009/2010 through FY2014/2015, and three 5-year planning periods from FY2015/2020 though FY2025/2030. The CIP by planning period is summarized in Table ES.8.
As presented in Table ES.7, the total capital cost for all facilities through 2020 is estimated at $615 million (M). Table ES.8 presents the anticipated phasing of capital cost through 2030, which shows that the total capital cost for all facilities through 2030 is estimated at $963M. The planning period with the largest portion of the overall CIP cost is FY11/12 with $252M (26 percent) of the total CIP.

It should be noted that the identified costs per fiscal year include the total required capital costs for funding each project. Actual capital expenditures for projects could extend out over the course of the project duration, which in some cases could be several years.
Table ES.8  Summary of Project Phasing
Capital Implementation Master Plan
West Basin Municipal Water District

<table>
<thead>
<tr>
<th>Planning Phase</th>
<th>Planning Year</th>
<th>Capital Cost</th>
<th>Percentage of Total Capital Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY09/15</td>
<td>FY09/10</td>
<td>$15,103,800</td>
<td>1.6%</td>
</tr>
<tr>
<td></td>
<td>FY10/11</td>
<td>$68,910,280</td>
<td>7.2%</td>
</tr>
<tr>
<td></td>
<td>FY11/12</td>
<td>$251,866,558</td>
<td>26.2%</td>
</tr>
<tr>
<td></td>
<td>FY12/13</td>
<td>$16,715,280</td>
<td>1.7%</td>
</tr>
<tr>
<td></td>
<td>FY13/14</td>
<td>$25,520,280</td>
<td>2.7%</td>
</tr>
<tr>
<td></td>
<td>FY14/15</td>
<td>$9,990,280</td>
<td>1.0%</td>
</tr>
<tr>
<td></td>
<td><strong>FY09/15</strong></td>
<td><strong>$388,106,478</strong></td>
<td><strong>40.3%</strong></td>
</tr>
<tr>
<td></td>
<td>FY15/20</td>
<td>$226,831,400</td>
<td>23.6%</td>
</tr>
<tr>
<td>Subtotal</td>
<td><strong>FY09-20</strong></td>
<td><strong>$614,937,878</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FY20/25</td>
<td>$163,327,500</td>
<td>17.0%</td>
</tr>
<tr>
<td></td>
<td>FY25/30</td>
<td>$184,597,500</td>
<td>19.2%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td><strong>$962,862,878</strong></td>
<td>100.0%</td>
</tr>
</tbody>
</table>

ES.7.3 CIP by Facility Type

The CIP cost distribution by project type is depicted on Figure ES.11.

![Distribution of Capital Improvement Costs by Facility Type](image-url)
As shown on Figure ES.11, the majority of costs are related to water treatment, consisting of $406M (42 percent) of the 2030 CIP. It should be noted that the additional treatment capacity is required to meet the projected demand and is not associated with any particular treatment plant location. As discussed in Section ES.5, adding a treatment plant to treat secondary effluent from the JWPCP is approximately $25M less costly than using the Hyperion WWTP as West Basin’s sole source of supply. The total CIP would be approximately $987M if West Basin does not take supply from JWPCP.

The CIP costs presented above are all based on 2009 dollars. However, as most projects will be implemented in the future, the actual CIP cost will be higher based on the phasing of each project. The CIP presented on Figure ES.12 shows the escalated CIP cost for each project phase with and without cost escalation, using an annual inflation rate of 3 percent. As presented in Figure ES.12, the escalated cost of the $963M (2009 Dollars) is $1,256M.

![Figure ES.12
Breakdown of Capital Costs by Phase including Escalation](chart)

The anticipated project locations are shown on Figures ES.13, ES.14, ES.15, and ES.16. Projects shown on these figures are labeled with project identifiers which are discussed in Chapter 9. Only pipeline projects are depicted on these figures. Details on other types of projects included in the CIP can be found in Chapter 9.
This page left blank intentionally.
Figure ES.14
Edward C. Little Water Recycling Facility (ELWRF) Area CIP

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems
Figure ES.16
New Treatment Plant (NTP) Area CIP

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems
This page left blank intentionally.