Hazen

Indio Water Authority
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# 2019
# Master Plan Update

December 2019

# Table of Contents

## List of Tables

## List of Figures

## List of Exhibits



## List of Appendices



## List of Acronyms

| Abbreviation | Definition |
|---|---|
| °F | Degrees Fahrenheit |
| ac | Acre(s) |
| ACP | Asbestos Cement Pipe |
| ADD | Average Day Demand |
| AF | Acre-Feet |
| AFY | Acre-Feet per Year |
| AOB | Area of Benefit |
| AWWA | American Water Works Association |
| bgs | Below Ground Surface |
| CCP | Bar-wrapped Concrete Cylinder Pipe |
| cfs | Cubic Feet per Second |

| Abbreviation | Definition |
|---|---|
| CIP | Capital Improvement Program/Project |
| CPUC | California Public Utilities Commission |
| CVSC | Coachella Valley Stormwater Channel |
| CVWD | Coachella Valley Water District |
| CWA | Coachella Water Authority |
| CWVD | Coachella Valley Water District |
| DA | Development Agreement |
| DIP | Ductile Iron Pipe |
| DWA | Desert Water Agency |
| DWR | California Department of Water Resources |
| EVRA | East Valley Reclamation Authority |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| gpcd | Gallons per Capita per Day |
| gpd | Gallons per Day |
| gpm | Gallons per Minute |
| GRP | Groundwater Replenishment Plan |
| HBP | Historically-Based Projection |
| HGL | Hydraulic Grade Line |
| hr | Hour |
| hrs | Hours |
| I-10 | Interstate 10 Freeway |
| IWA | Indio Water Authority |
| JPA | Joint Powers Authority |
| LxW | Length by Width |
| MCL | Maximum Contaminant Level |
| MDD | Maximum Day Demand |

| Abbreviation | Definition |
|---|---|
| MDMWC | Myoma Dunes Mutual Water Company |
| MG | Million Gallons |
| MGD | Million Gallons per Day |
| MWD | Metropolitan Water District of Southern California |
| NRW | Non-Revenue Water |
| OS | Open Space |
| PHD | Peak Hour Demand |
| PRV | Pressure Reducing Valve |
| psi | Pounds per Square Inch |
| PVC | Polyvinyl Chloride |
| R/W, ROW | Right-of-Way |
| RAC | Replenishment Assessment Charge |
| RV | Recreational Vehicle |
| SB | Senate Bill |
| SE | Southeast |
| SGMA | Sustainable Groundwater Management Act |
| SNMP | Salt Nutrient Management Plan |
| SP | Specific Plan |
| SWP | State Water Project |
| SWRCB | California State Water Resources Control Board |
| TDH | Total Dynamic Head |
| TDS | Total Dissolved Solids |
| US | United States |
| UWMP | Urban Water Management Plan |
| VFD | Variable Frequency Drive |
| VSD | Valley Sanitary District |
| WRF | Water Reclamation Facility |

| Abbreviation | Definition |
|---|---|
| WMP | Water Master Plan |
| WSA | Water Supply Assessment |
| WSCP | Water Shortage Contingency Plan |

# Executive Summary

In 1930, City of Indio became the first incorporated city in the Coachella Valley. Over the next 90 years, Indio has grown into the largest city in the valley with over 85,000 residents. In 2000, the city of Indio and Redevelopment Agency formed Indio Water Authority (IWA) as a Joint Powers Authority (JPA). Over the last 20 years, IWA has provided safe, reliable and efficient water service to the residents and commercial customers within the City of Indio.

The 2019 Water Master Plan Update examines the current and future needs of IWA's water system over the next twenty-years from 2019 to 2038. The update provides IWA a long-term strategy for implementing system improvements to meet system demands. Additionally, it identifies the necessary replacements to meet its operational needs and ability to comply with existing regulatory requirements and provide a water supply to meet those demands. The components of the study include demand analysis, supply evaluation, an update to the hydraulic model, system evaluation, scenario analysis, operational programs overview and the development of the capital improvement projects over next two decades.

The approach of the master plan is to perform an analysis of those components. Below is a summary of those components and results.

**Demand Projections.** IWA has seen an overall decline in water demand approximately four years despite an average annual 4 percent increase in population. However, as shown in Figure ES-1, that trend began to reverse itself in 2017 with the drought restrictions removed and future population growth, especially in the undeveloped northeastern portion of the service area is expected to have a large influence on future water demand. As shown in Figure ES-2, by taking into account projected future growth, we estimate a net annual average water demand growth rate of roughly 1.4 percent over the 20-year planning period.

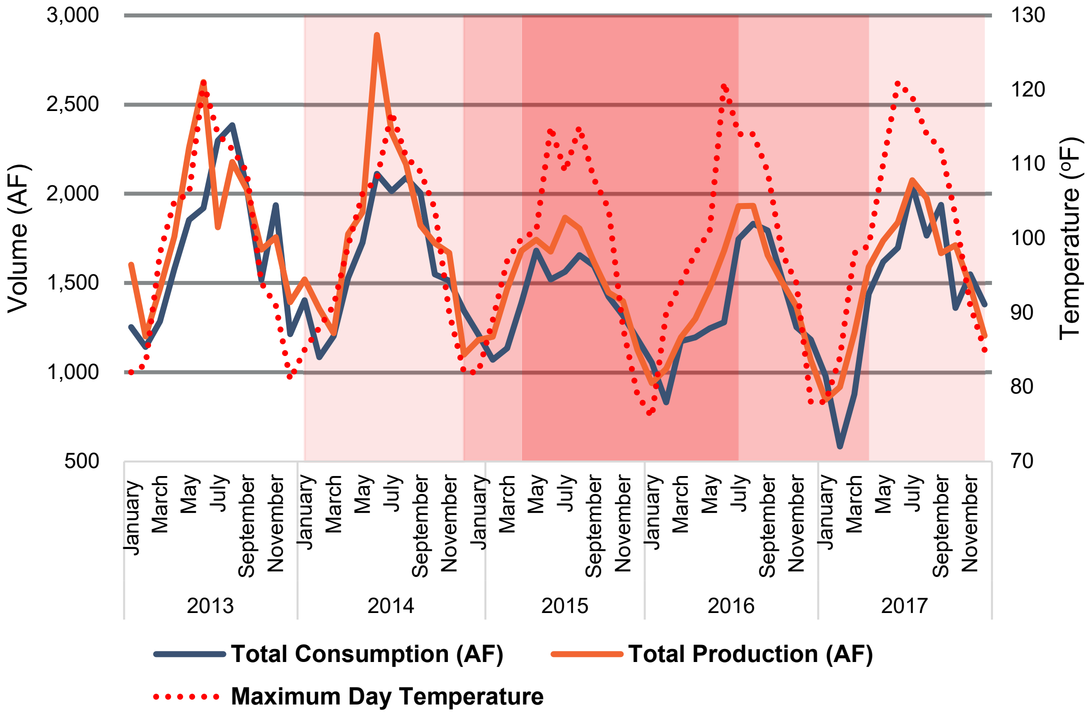


**Figure ES-1: Drought Measure Impacts on Demand**

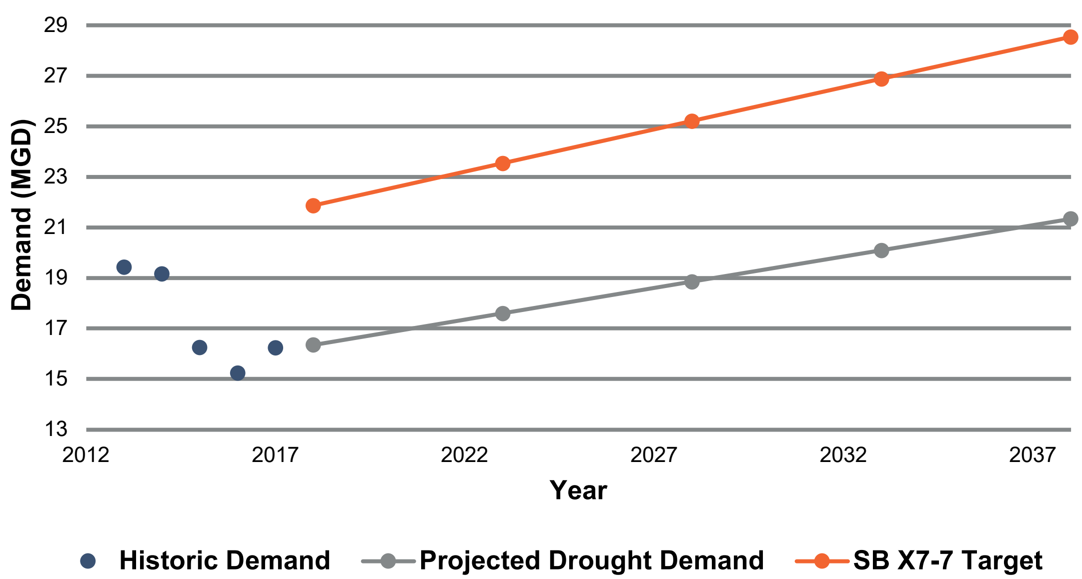


**Figure ES-2: Historic Demands, Projected Drought and Non-Drought Demands**

**Supply Strategy.** The supply strategy for IWA focuses on two objectives: the first objective is to maintain a supply capacity that exceeds the demand so that two supply wells can be non-operational for maintenance or emergency. Current groundwater production of 21,000 acre-feet per year is expected to increase by about 20-percent over the next ten years and nearly 70-percent by the end of the 20 year planning period.

The second objective is to identify a sustainable water supply source that will meet the long-term demand of the City. Although there are several supply options available to IWA, including developing new water sources and demand offsets, finding a sufficient supply will require considerable expenditures. Specific new water source options considered, include surface water from either Coachella Valley Water District (CVWD) or Metropolitan Water District of Southern California (Metropolitan), and the Cadiz Water Project. Demand offsets include recycled water from Valley Sanitary District (VSD), and conservation and efficiency statutes. None of these options are low cost and they range from $540 per acre-foot (AF) to nearly $1,900 per AF with recycled water at around $1,200 per AF.

**Hydraulic Model Update.** IWA's hydraulic model has been updated several times over the last decade. First in 2011 as part of the Pump Operational Plan Energy Model Implementation, then for the Near Term CIP Development as part of the 2012 WMP Update, and again in 2015 to support the Chromium-6 Treatment and Compliance Study. We have performed a detailed update of the hydraulic model for this WMP to ensure an accurate representation of the existing water distribution system and to support accurate hydraulic modeling results. Facilities were updated using the latest GIS database. In conjunction with this, demands, elevations, and fire flow requirements were also updated. A desktop calibration was performed using IWA SCADA data and discussions with IWA staff, which resulted in similar system pressures and reservoir level cycling as indicated in the SCADA data.

**System Evaluation.** A series of hydraulic model scenarios were performed to evaluate the system in terms of service pressures, pipeline velocities, available fire flow, water age, operational controls, and pipe looping. In addition, desktop analyses were performed to evaluate well supply, pumping capacity, and reservoir storage. The results of these analyses formed the basis for recommendations to the Capital Improvement Program (CIP). The IWA system overall is robust in terms of supply and backbone conveyance; however, key issues identified included low pressure in the western areas of the Main Zone; high pressures in the Terra Lago Zone; limited fire flow availability in residential pockets and the industrial area in the eastern Main Zone; increasing water age in the northern areas of the system; some limitations in the Plant 1, 2, and 4 booster pump capacity; and sensitive operation of the Main Zone due to its closed zone operation.

**Future Scenario Analysis.** Future scenarios including buildout demands of infill as well as future developments in the Sphere of Influence were performed for ultimate facility sizing. Future developments are particularly important to the operation and expansion of the Terra Lago Zone, as it will be critical in at least the first phases of the Citrus Ranch and Stonewater developments.

**Operational Programs Evaluation.** An evaluation of the operational programs was done to determine if IWA was performing operational items routinely to adequately address aging or nonstandard infrastructure. IWA has a robust horizontal asset registry for valves, pipe, services, hydrants and meters. However, improvement is needed in the vertical assets by building an asset registry and standard operating procedures for each asset. Currently IWA is working on the development of each, which would greatly benefit timely maintenance and replacement. Refer to Table ES-1 for a summary of operational program costs over the planning horizon.

**Development of Capital Improvement Program.** The development of the Capital Improvement Program projects and project schedule is the result of this master planning document. The capital improvement projects were prioritized based on a specific criterion and scheduled within the planning horizon. IWA plans to maintain its CIP projects and programs.

Overall, the existing system provides the necessary supply to meet the current demand and maintain the level of service expected by a utility of its size.

# 1. Introduction and Background

The 2019 Water Master Plan (WMP) has been prepared as an update to the Indio Water Authority (IWA) 2012 Water Master Plan Update. IWA typically performs a comprehensive update of its WMP every five years to capture changes in water conveyance infrastructure, service population, water demands, planned developments, and water-related regulations to update their Capital Improvement Program (CIP). As the City of Indio continues to grow amid increasingly restrictive water supply conditions, water master planning has become even more vital for IWA to address any existing deficiencies, improve operations and efficiency, and develop the necessary supply to meet future demands. In that vein, IWA plans to update its CIP on a continuous basis. The information presented in this WMP serves to inform IWA on current and future iterations of the CIP.

## 1.1 History

The City of Indio (City, or Indio), located in the Coachella Valley in Riverside County, California, began as a railroad town in 1876 as an outpost as Southern Pacific Railroad built lines between Yuma, Arizona and Los Angeles, California. The town soon developed into an agricultural region by utilizing well water and water from the All-American Canal, and in 1930, Indio became the first incorporated city in the Coachella Valley. IWA was formed as a Joint Powers Authority (JPA) between the City of Indio and the Redevelopment Agency of the City of Indio (succeeded by the Housing Authority of the City of Indio) in the year 2000 to deliver water to the City of Indio. In 2013, the East Valley Reclamation Authority (EVRA) was created under a joint powers agreement between the City of Indio through IWA and Valley Sanitary District (VSD) to plan, implement, and operate a recycled water program. IWA is located at 83101 Avenue 45, Indio, CA 92201 and is governed by the IWA Board, which includes the five members currently elected to the Indio City Council.

## 1.2 Purpose and Scope

The 2019 Water Master Plan has been prepared to evaluate IWA's water system under existing conditions and for a 20-year planning horizon in five-year increments. The WMP develops a Capital Improvement Program (CIP) that identifies the capital improvement projects needed to ensure that IWA continues to provide safe, reliable, and efficient water service. Project capital costs have been estimated and projects have been prioritized in a Master Schedule in support of IWA's long range financial planning.

The major components of the scope include:

- Determine existing and projected water demands with respect to average day, maximum day, peak hour, and maximum day plus fire flow
- Develop a supply strategy by evaluating available and potential supply sources
- Update and calibrate the existing hydraulic model
- Evaluate production and distribution system capacities
- Evaluate operating programs
- Address the impacts on supply by the Salt Nutrient Management Plan (SNMP) and Sustainable Groundwater Management Act (SGMA)

- Develop capital improvement projects and master schedule
- Prepare the WMP report

A list of reference documents used in the preparation of this WMP is included in Appendix A.

## 1.3 Study Area

IWA's service area is in the central Coachella Valley, Riverside County, California. IWA serves a population of approximately 85,000 persons and approximately 23,000 connections within a 24-square-mile service area with an additional 18 square miles to the north designated as future service area. The Coachella Water Authority (CWA) service area is located to the southeast, Myoma Dunes Mutual Water Company (MDMWC) to the west, and Coachella Valley Water District (CVWD) to the west. The Coachella Valley Stormwater Channel (CVSC) crosses the service area flowing from west to east, and the Coachella Canal flows from east to west along the northern most edge of the current service area. The service area is intersected by the Interstate 10 (I-10) Freeway and State Route 111 (Highway 111) and generally coincides with the City of Indio boundary; however, CVWD provides water service to the northwest portion of the City (north of I-10 and west of Madison Street, a portion of the Sun City community). There are also several mutual water companies and other areas served by private wells including the Polo Grounds, Plantation Golf Course, and ranch areas. IWA had temporarily provided water service to the Mesquite Mutual Water Company – water service was transferred to CWA in 2016. Refer Table 1-1 for a list of mutual water companies within the IWA service area boundary.

**Table 1-1: Mutual Water Companies**

| Mutual Water Company |
|---|
| Carver Mutual Water |
| Riverdale Estates & RV Resort |
| Boe Del Heights |
| Waller Tract |

It should be noted that two of the mutual water companies – Boe Del Heights and Waller Tract – have been supplied by IWA since 2015. Currently, IWA is working to consolidate Boe Del Heights and the Waller Tract. The Riverdale Estates & RV Resort and Carver Mutual Water will likely be consolidated by the end of the planning horizon.

See Exhibit 1-1 for the vicinity map and Exhibit 1-2 for the service area map.

## 1.4 Topography and Climate

The IWA service area is in the Salton Trough between the Little San Bernardino Mountains to the north, and the San Jacinto and Santa Rosa Mountains to the west, with the Salton Sea located to the south. The area generally slopes gently downward from north to south and west to east with roughly the lower half of the service area below sea level.

The topography of the Coachella Valley contributes to its unique climate, characterized as arid with warm winters and hot summers. The average low temperatures during winter are around 40 degrees Fahrenheit

(°F), and the average high temperatures during summer are around 106°F with a record high of 125°F. Precipitation is minimal, with a total annual precipitation of less than 4 inches[1].

[1] Western Regional Climate Center, Indio Fire Station (044259). https://wrcc.dri.edu/.

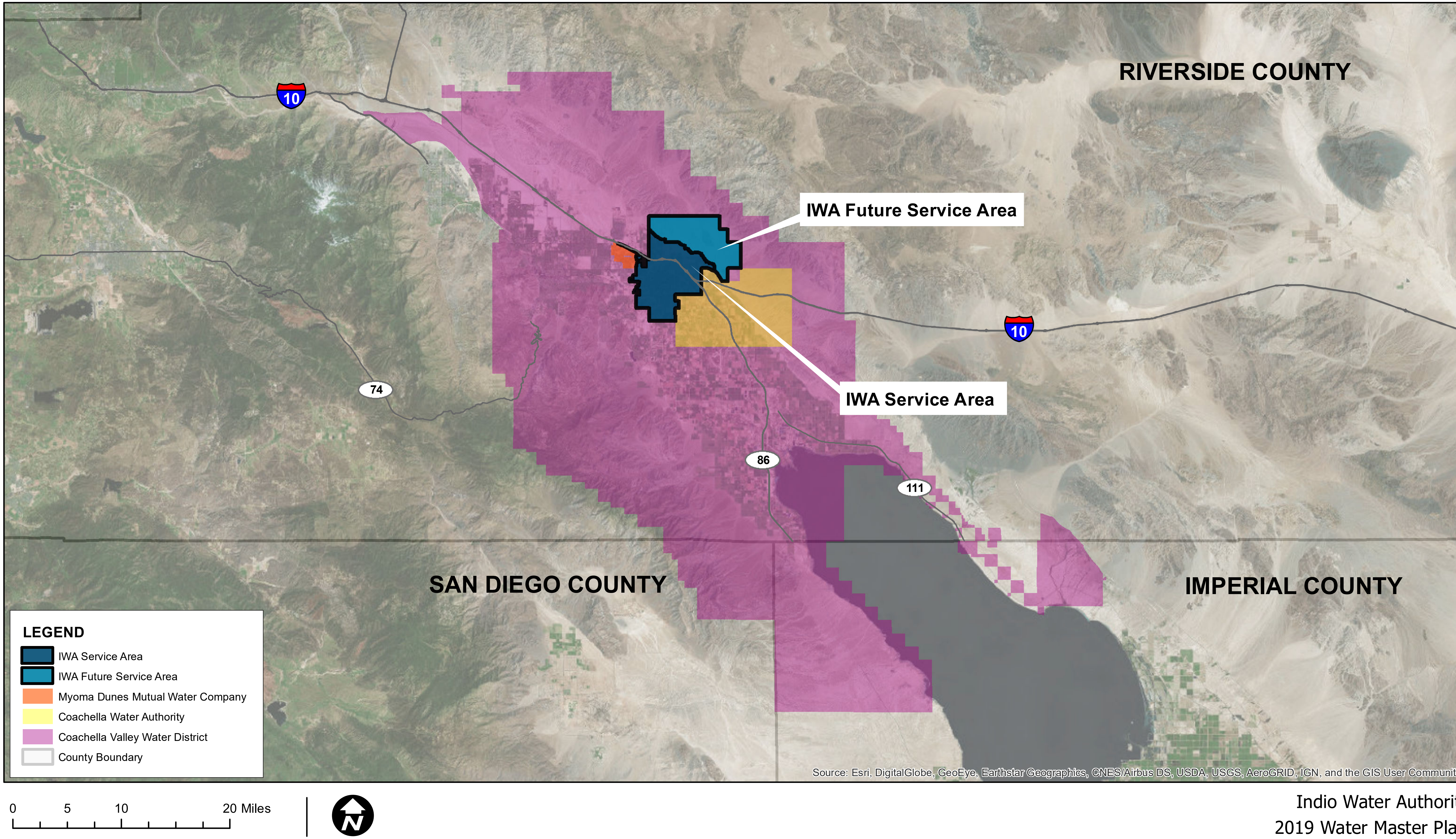


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Exhibit 1-1
Regional Map

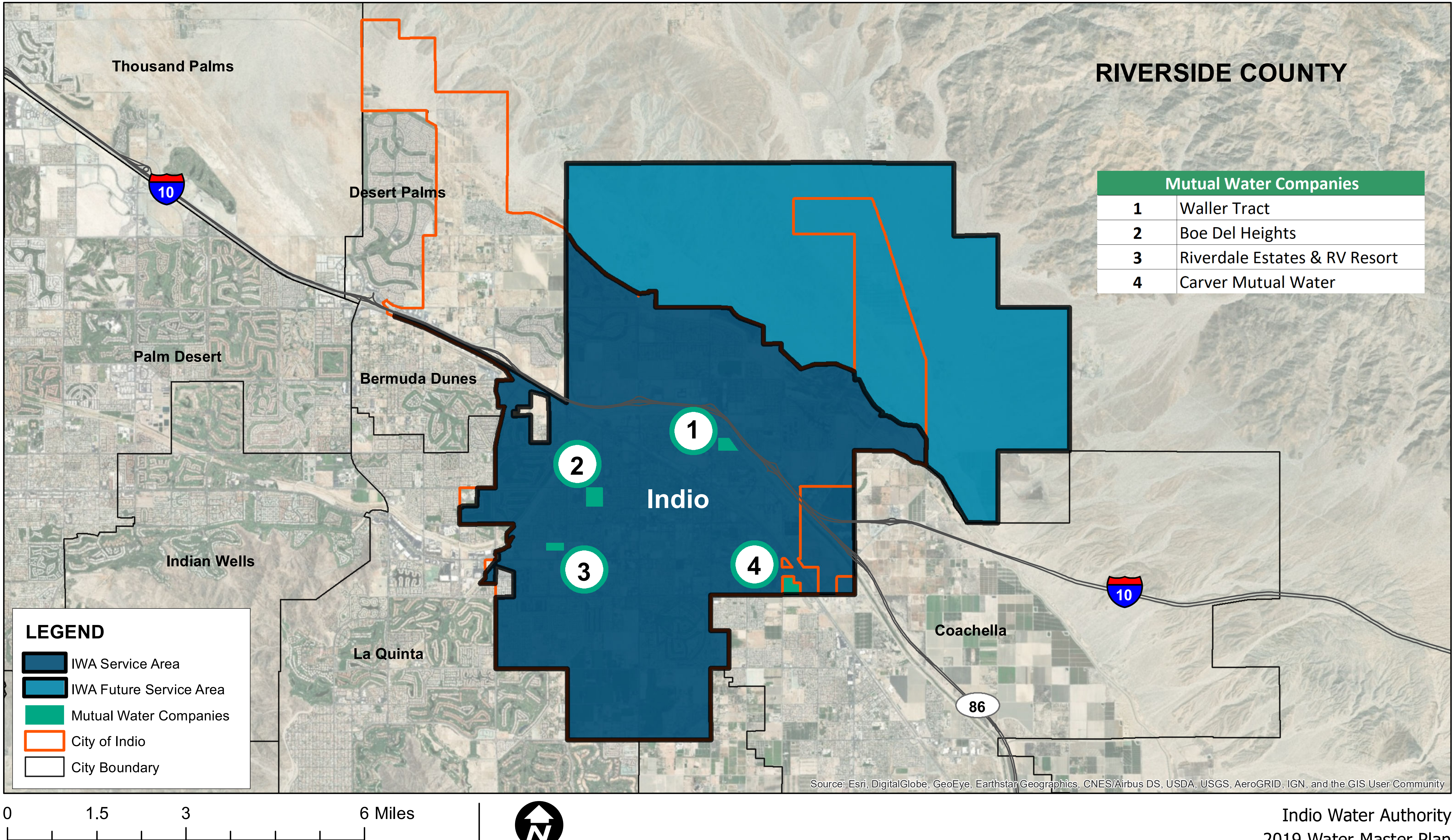


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Exhibit 1-2
Service Area

# 2. Land Use

Indio's land use patterns have changed over time, beginning as an agricultural center in the early 1930s to the thriving residential community it is today. Indio has also become a popular destination for seasonal residents due to the mild climate in the winter and tourists attending the many festivals. This section summarizes the existing land use, planned developments, and future land use projections. Determining land use is an important factor in a hydraulic model in properly allocating residential, commercial, and industrial water demands as well as proper fire flow allocation, which is essential in hydraulic model accuracy.

## 2.1 Existing Land Use

The service area is primarily single-family residential land use with commercial and industrial corridors situated along I-10, Indio Boulevard, and Highway 111. Several multi-family and mobile home communities are within the service area with several golf courses located around the periphery. Vacant parcels are scattered throughout the service area, and a large undeveloped area is to the north of the future service area.

Existing land use data were obtained from the City of Indio in April of 2018, which assigns land parcels to specific land uses according to Land Use Codes. The City is currently updating its land use data for the General Plan update. Current land use data do not indicate if a parcel is vacant or not, which can influence the estimated demand on the system. The method for assessing future land use and the allocation of demands is discussed in the demand section of this update. Other land uses such as street right-of-way, golf courses (golf courses are irrigated with private wells and/or Canal water), and freeways are not included in this analysis. For the purposes of the WMP, the Land Use Codes were grouped into land use designations corresponding to IWA billing categories.

Refer to Table 2-1 for land use acreages and groupings, Table 2-2 for an overall summary, and Exhibit 2-1.

**Table 2-1: Existing Land Use**

| City of Indio Land Use Category | Allocated Billing Category | Area (ac) |
|---|---|---|
| Business Park | Commercial/Institutional | 466.7 |
| Commercial Office | Commercial/Institutional | 117.7 |
| Community Commercial | Commercial/Institutional | 562.2 |
| Country Estates | Single Family Residential | 2,499.5 |
| Country Estates Transition | Single Family Residential | 88.5 |
| Downtown Commerce | Commercial/Institutional | 91.0 |
| Equestrian Estates | Single Family Residential | 653.8 |
| Industrial Park | Commercial/Institutional | 351.8 |
| Manufacturing | Industrial | 357.1 |
| Mixed Use (DA)[1] | Commercial/Institutional | 190.9 |
| Mixed Use (SP)[2] | Commercial/Institutional | 813.2 |
| Neighborhood Commercial | Commercial/Institutional | 35.3 |
| Open Space | Landscape irrigation | 6,146.4 |
| Public | Commercial/Institutional | 739.7 |
| Regional Commercial | Commercial/Institutional | 163.8 |
| Residential - High | Multi-family Residential | 302.8 |
| Residential - Low | Single Family Residential | 4,942.8 |
| Residential - Medium | Single Family Residential | 1,169.4 |
| Resource Recovery | Industrial | 1,052.1 |
| Village Core | Multi-family Residential | 85.7 |
| | **TOTAL** | **20,830.6** |

[1] DA = Development agreement
[2] SP = Specific plan

**Table 2-2: Existing Land Use Summary**

| Allocated Billing Category | Area (ac) |
|---|---|
| Single Family Residential | 9,354.0 |
| Multi-family Residential | 388.5 |
| Commercial/Institutional | 3,532.4 |
| Industrial | 1,409.3 |
| Landscape irrigation | 6,146.4 |
| **TOTAL** | **20,830.6** |

## 2.2 Future Land Use

Demand projections were made based on population in lieu of changes in land use over time, apart from large specific plan developments that are currently located outside of the IWA service area boundary but are in IWA's future service area. This approach is intended to more accurately capture overall population growth due to the uncertainty of housing and commercial developments. Refer to Section 3 for more information on demand projections.

### 2.2.1 Planned Developments

IWA is currently tracking approximately 20 proposed single and multi-family residential developments ranging from small to mid-size developments up to approximately 100 acres that are in varying stages of the planning process. Many of these developments are planned for the area north of the 10 Freeway, while there is another group of developments proposed in the south-central area of the City. Refer to Appendix B for a list of planned development projects.

IWA is also aware of four large potential developments in the future IWA service area to the northeast described in the following sections.

#### *2.2.1.1 Citrus Ranch*

The 2006 Water Supply Assessment (WSA) and 2007 Specific Plan identified Citrus Ranch as a proposed 1183-acre residential development in the City of Indio's Sphere of influence, which is defined as the future service area of IWA, northeast of the City boundary. The development was proposed to include up to 3,075 residential units ranging from low to high density, golf course, clubhouse, community center, boutique hotel, fire station, trails, and parks. The property was sold in 2014 and renamed to "Grand Valley" and sold again in 2018. A breakdown of proposed land use per the 2006 WSA is included in Table 2-3. It is noted that a Water Supply Assessment and Verification was also prepared in 2012, which had used project demands from the 2007 Water Master Plan Update, which were approximately 10 percent lower than the 2006 WSA..

**Table 2-3: Citrus Ranch Land Use**

| Land use | Area (ac) |
|---|---|
| Residential | 576.0 |
| Boutique Hotel | 5.4 |
| Clubhouse | 6.0 |
| Community Center | 5.0 |
| Open Space | 520.6 |
| *Undisturbed Open Space* | *186.7* |
| *Wilderness Trails* | *3.0* |
| *Community Parks* | *6.1* |
| *Neighborhood Parks* | *9.3* |
| *Citrus Grove Paseos* | *11.3* |
| *Recreation OS & Playfields* | *56.2* |
| *Dillon Road Landscape* | *7.2* |
| *Golf Course* | *233.1* |
| *SE Drainage Channel* | *7.7* |
| Community Collector Streets | 60.0 |
| Dillon Road R.O.W. | 3.9 |
| Golf Course Maintenance Yard | 1.6 |
| Fire Station Site | 2.0 |
| Well Site | 3.0 |
| **TOTAL** | **1,183.5** |

Source: Citrus Ranch Residential Development. Draft Water Supply Assessment, SB 610 and SB 221. October 19, 2006. Stantec Consulting, Inc.

#### *2.2.1.2 Stonewater*

Neither a specific plan nor water supply assessment for the proposed Stonewater development was available at the time of preparation of this master plan. Based on developer brochure information[1], Stonewater is described as an 818-acre development that proposes 2,364 residential units, hotel/resort, commercial/retail, and motor coach resort. The residential units include 300 condos and 2,064 homes.

[1] RoBott Land Company. Exclusive Offering Memorandum. Stonewater @ Indio Hills. https://uploads-ssl.webflow.com/5ac7f5cfe4871d7816645f22/5ad90cfcbcb3006a0970f66e_Stonewater-Brochure.pdf

The project is located at the southeast corner of Dillon Road and Avenue 42 / Fargo Canyon Road in the Indio Hills two miles north of I-10. The proposed land use breakdown is included in Table 2-4.

**Table 2-4: Stonewater Land Use**

| Land use | Area (ac)[1] |
|---|---|
| Undevelopable | 13.7 |
| Restricted Use | 59.7 |
| Utility Easements | 32.1 |
| Reservoir Sites | 6.0 |
| R.O.W. | 10.3 |
| Hillside Areas / Open Space or Recreation Amenity | 19.5 |
| Drainage Facilities | 50.3 |
| Parks and Trails | 25.0 |
| Internal Collector Roads | 36.4 |
| Resort Hotel and Condominiums | 25.0 |
| Retail / Commercial | 25.3 |
| Motor Coach Resort / Commercial | 62.0 |
| Multi-Family Rental Condominiums | 15.0 |
| Single Family Residential | 438.0 |
| **TOTAL** | **818.2** |

[1] Source: RoBott Land Company Exclusive Offering Memorandum. Retrieved September 18, 2018.

### *2.2.1.3 Dillon Trails*

Dillon Trails is a potential development located just adjacent to the proposed Citrus Ranch on the east side of Dillon Road. Neither a specific plan nor water supply assessment for the proposed Dillon Trails development was available at the time of preparation of this master plan. Based on developer website information[2], Dillon Trails is described as a 210-acre development that would include a mix of residential and commercial uses. An estimate of the land use breakdown is listed in Table 2-5.

[2] John L. Cover & Associates. http://www.jlcover.com/properties.html. Accessed September 18, 2018.

**Table 2-5: Dillon Trails Land Use**

| Land use | Area (ac) |
|---|---|
| Low Density Residential | 125.2 |
| Medium Density Residential | 24.1 |
| Commercial | 1.1 |
| Open Space | 31.8 |
| Right-of-Way | 27.8 |
| **TOTAL** | **210.0** |

### *2.2.1.4 Dillon Ranch*

Little information is currently available for potential development at Dillon Ranch, which is located just east and north of the Citrus Ranch and Dillon Trails developments, respectively. Dillon Ranch is a group of parcels totaling 109-acres that could include residential and commercial uses. An estimate of the land use breakdown is listed in Table 2-6.

**Table 2-6: Dillon Ranch Land Use**

| Land use | Area (ac) |
|---|---|
| Medium Density Residential | 64.2 |
| Commercial | 12.0 |
| Open Space | 29.9 |
| Right-of-Way | 2.9 |
| **TOTAL** | **109.0** |

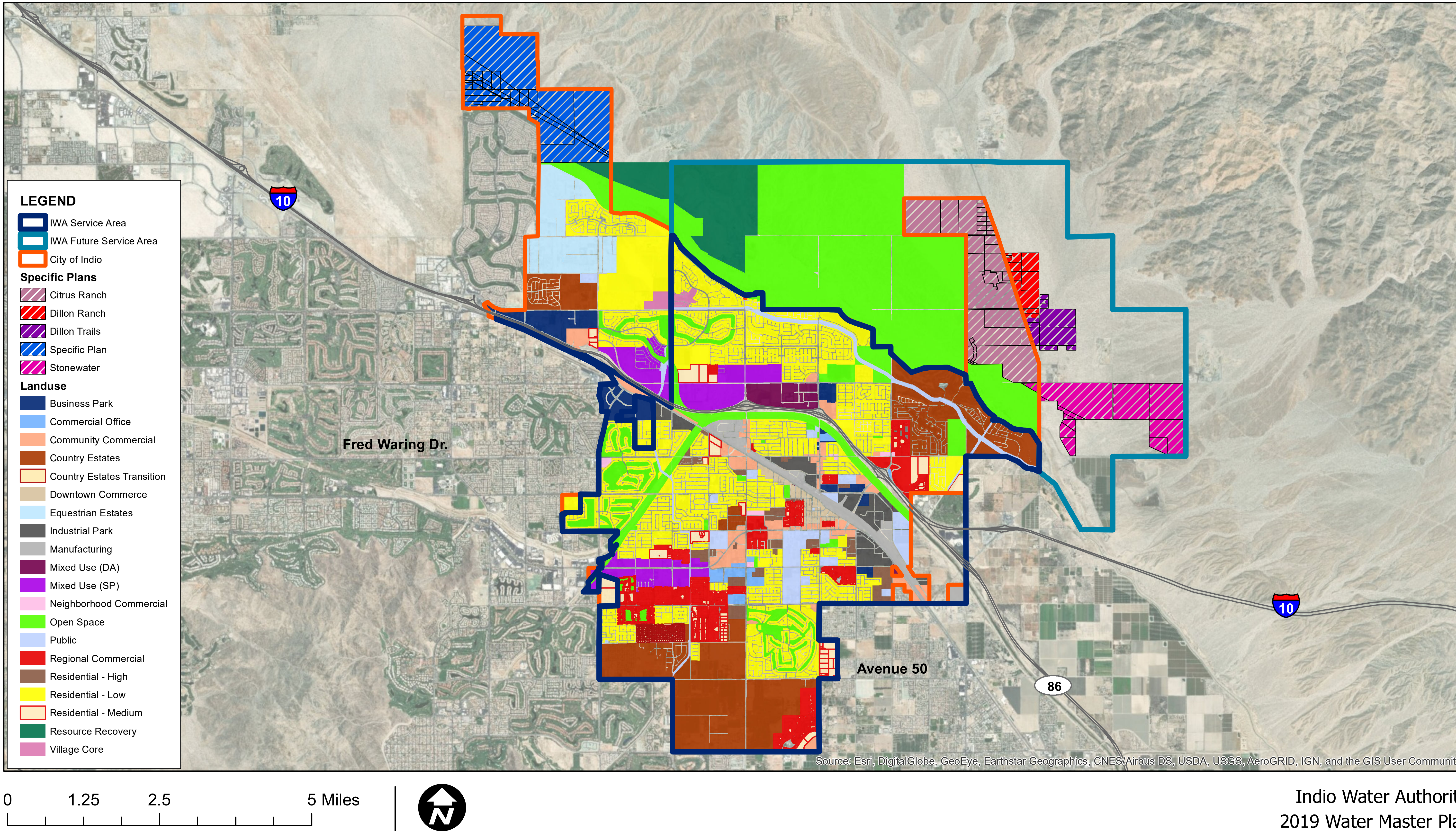


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Exhibit 2-1
Land Use

# 3. Water Demands

The consumption of water is the driving force behind the hydraulic dynamics occurring in water distribution systems. When simulating these dynamics in the water distribution model, an accurate representation of system demands is as critical as modeling the physical components.

## 3.1 Existing Demands

### 3.1.1 Production and Consumption

Existing water demands were determined using a combination of groundwater well production records and billing records for metered customer use. Production records are reported by production source (i.e., groundwater well) while billing records are reported by billing code and summarized report categories. Available production figures included calendar years (January to December) 2013 to 2017, while available billing records included fiscal years (July to June) 2012/2013 to 2017/2018. Because of the reporting differential, only complete and overlapping records were utilized from calendar years 2013 to 2017. Refer to Figure 3-1 for a comparison of production and consumption.

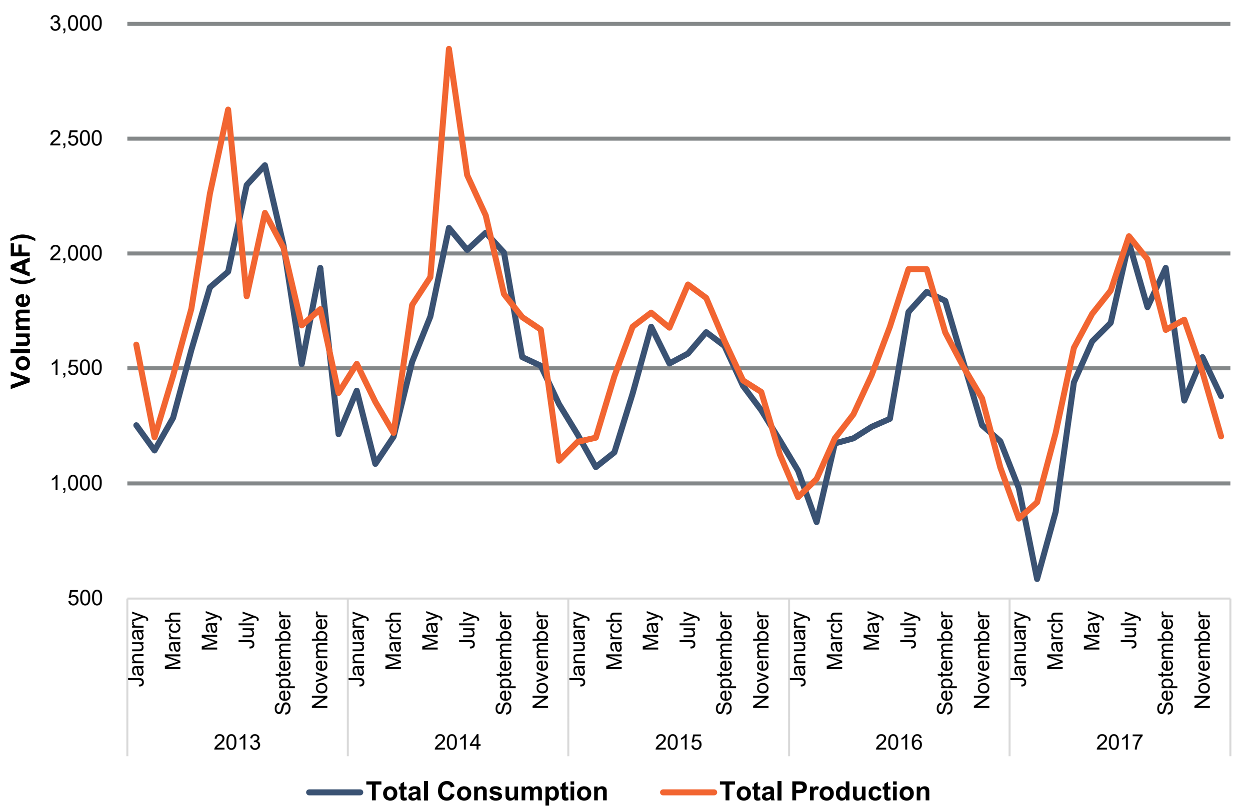



**Figure 3-1: Production vs. Consumption**

In general, production and consumption figures were observed to have a high degree of correlation with the exception of June 2014, and to a lesser extent, May 2013 to July 2013. The cause for the sudden jump in production in June 2014 was unable to be determined by IWA staff; however, all production and consumption data were utilized for demand calculations.

### 3.1.2 Non-revenue Water

In general, production exceeds consumption on an overall basis, although in the short term, it is possible for consumption to exceed production due to water storage and accounting carryovers. The difference between production and billing records, referred to as non-revenue water, may be attributed to a variety of reasons including unbilled consumption such as fire-fighting, unauthorized consumption, metering inaccuracies, data handling errors, as well as leakage, overflows, and other discharges such as flushing or pressure relief. Non-revenue water can be defined as unbilled authorized consumption plus water losses. Table 3-1 illustrates how AWWA accounts for various system demands.

**Table 3-1: AWWA Water Balance**

<table>
<tr><td rowspan="8">Own Sources (Adjusted for known errors)</td><td rowspan="11">System Input</td><td>Water Exported</td><td colspan="3">Billed Water Exported</td><td>Revenue Water</td></tr>
<tr><td rowspan="10">Water Supplied</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption (water exported is removed)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Water Imported</td><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

Currently, there are no regulations on the amount of allowable water loss, although SB 555 and SB 1420 require that water suppliers periodically submit water loss audits to the California Department of Water Resources (DWR); SB 555, however, will require that the California State Water Resources Control Board (SWRCB) adopt rules requiring urban retail water suppliers to meet performance standards for the volume of water loss between January 1, 2019 and July 1, 2020. Based on past industry standards, a water loss rate of about 10 percent is considered acceptable. As shown in Figure 3-2, over the past five years, IWA's non-revenue water has remained under 10 percent, declining over the past four years to a current non-revenue water of approximately 6 percent.

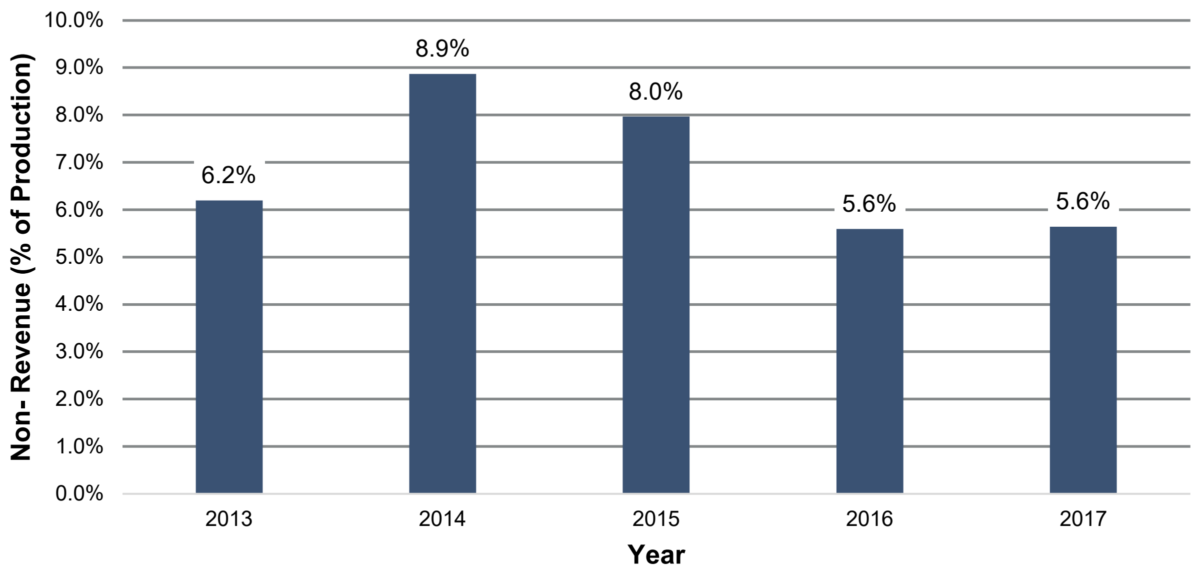



**Figure 3-2: Non-Revenue Water**

### 3.1.3 Drought Impacts

As shown in Figure 3-3, beginning in 2014, water demand sharply decreased from the previous year and continued to decrease in 2015 and 2016, albeit at a slower rate, despite new connections being added to the system. This trend is attributable to the series of drought state of emergency measures implemented beginning in early 2014. As the drought heightened in mid-2015 to mid-2016, mandatory restrictions were imposed by the SWRCB, that compelled IWA to implement compulsory day-of-the-week outdoor watering restrictions and drought penalties. In the latter half of 2016, outdoor watering restrictions were relaxed. IWA eventually lifted the drought penalties in April 2017 after the drought was finally declared over. Table 3-2 summarizes the measures implemented over the drought period. Figure 3-3 shows water demand rebounding in 2017, suggesting that per capita demand is increasing with the elimination of the drought penalties.

**Table 3-2: Drought Measures Timeline**

| Date | Stage | Measures |
|---|---|---|
| 1/17/2014 | Governor declares drought State of Emergency | Expansion of conservation program and rebates, budget-tiered rates implemented |
| 11/19/2014 | IWA declares Stage II of WSCP | Wasteful water practices prohibited |
| 4/1/2015 | SWRCB mandates IWA to reduce water use by 36% | Additional outdoor water restrictions, penalties implemented |
| 6/21/2016 | SWRCB mandate reduced from 36% to 32%, to 27% | Additional outdoor water restriction lifted |
| 4/7/2017 | End of drought State of Emergency | Drought penalties lifted. Wasteful water practices continue to be prohibited |

Figure 3-3 illustrates the impact of drought measures on demands over time. The shaded areas correlate with the dates in Table 3-2.

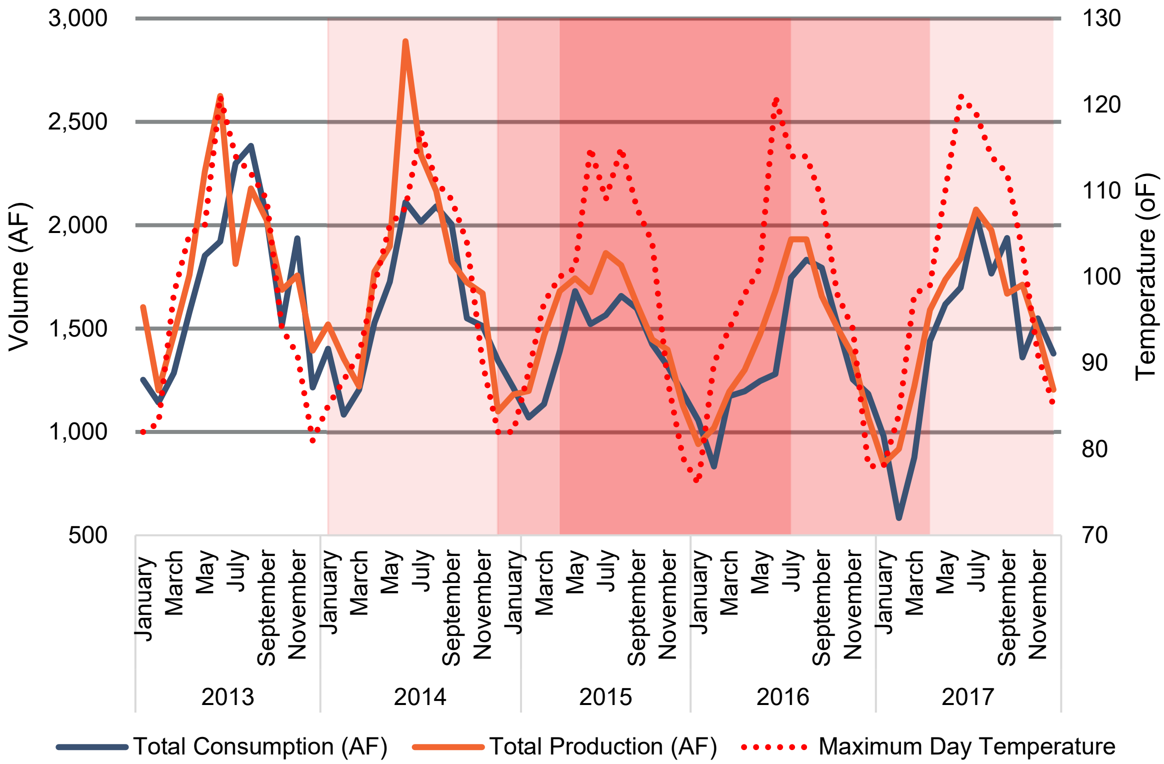



**Figure 3-3: Drought Measure Impacts on Demand**

Figure 3-4 illustrates the trend in single family residential consumption per connection.

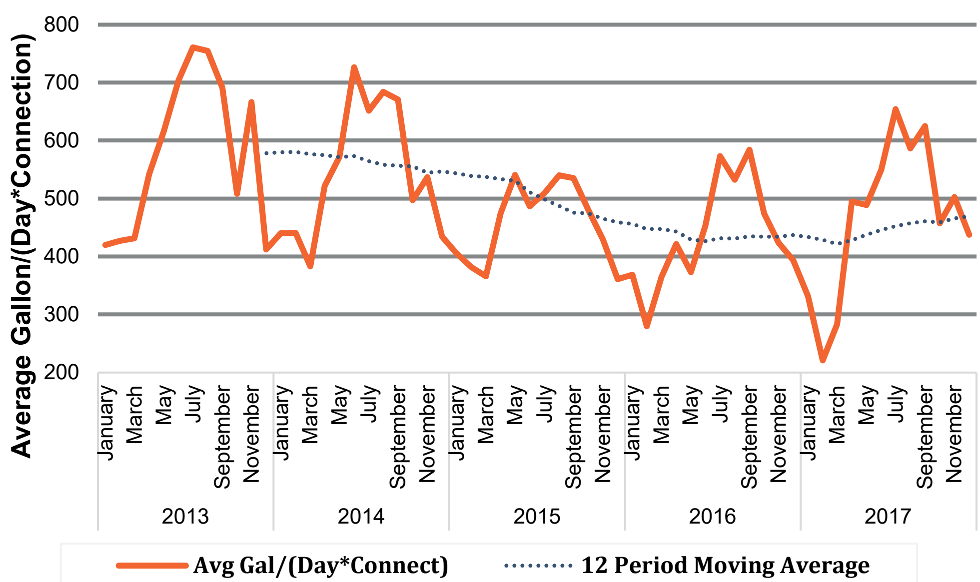



**Figure 3-4: Single Family Residential Demand Per Connection**

Because the peak drought restrictions occurred between 2015 and 2016, production for those years were averaged to establish an existing drought-impacted demand. Using the average 2015-2016 demand and the average 2015-2016 IWA service area population, an existing drought-impacted per capita demand of 204 gallons per capita per day (gpcd) was calculated. The lifting of the drought restrictions will like result in a return to some pre-drought consumption behavior and a rebounding of demand, although a portion of the reduced demand will remain due to permanent modifications such as landscape conversion. For planning purposes, the envelope of projected demands is assumed to be within the drought-impacted per capita water consumption of 204 gpcd and the 2020 per capita water use target set by SB X7-7 by the 2015 UWMP of 262 gpcd.

Land use-based demand factors, shown in Table 3-3, were calculated first by grouping each parcel of land in the service area from the City of Indio land use shapefile into a billing category based on its parcel land use category. Then, the acreages for each billing category were summed and the average daily consumption for each billing category was divided by this area, resulting in demand factors per acre.

**Table 3-3: Existing Demand Factors**

| City of Indio Billing Category | 2015/2016 Average Demand (gpd) | Total Area (ac) | 2015/2016 Average Demand factor (gpd/ac) | SB X7-7 Demand Factor (gpd/ac)[1] |
|---|---|---|---|---|
| A. Single Family Residential | 9,719,116 | 7,146.0 | 1,360 | 1,745 |
| B. Multi-family Residential | 1,532,759 | 337.4 | 4,542 | 5,817 |
| C. Commercial/Institutional | 2,455,814 | 2,795.4 | 879 | 1,128 |
| D. Industrial | 125,728 | 357.1 | 352 | 452 |
| E. Landscape irrigation | 1,839,313 | 1,503.5 | 1,223 | 1,571 |
| F. Other | 0 | 0.0 | 0 | 0 |

[1] Average of year 2015 and 2016 consumption scaled up to SB X7-7 gpcd 2020 Target.

## 3.2 Demand Projections

### 3.2.1 Population

A population projection-based method was utilized to project demands for the 20-year planning period from 2018 to 2038 in 5-year increments. Due to the fact that the IWA service area differs somewhat from the City of Indio boundary, the population served by IWA is approximately 90 percent of the City of Indio population.

Using data from the US Census Bureau, General Plan 2020, 2010 IWA UWMP, and 2015 IWA UWMP, a historical account of the City of Indio's and IWA's service area population for years 2010 to 2017 is shown in Figure 3-5. Years prior to 2010 were not included due to large variations in population that resulted from the housing market bubble that began in the early 2000s and extended to 2010. Note that for years 2016 and 2017, the IWA service area population was estimated based on a percentage of the City of Indio's population. The average historical annual growth rate of the IWA service area population has been approximately 1.7 percent.

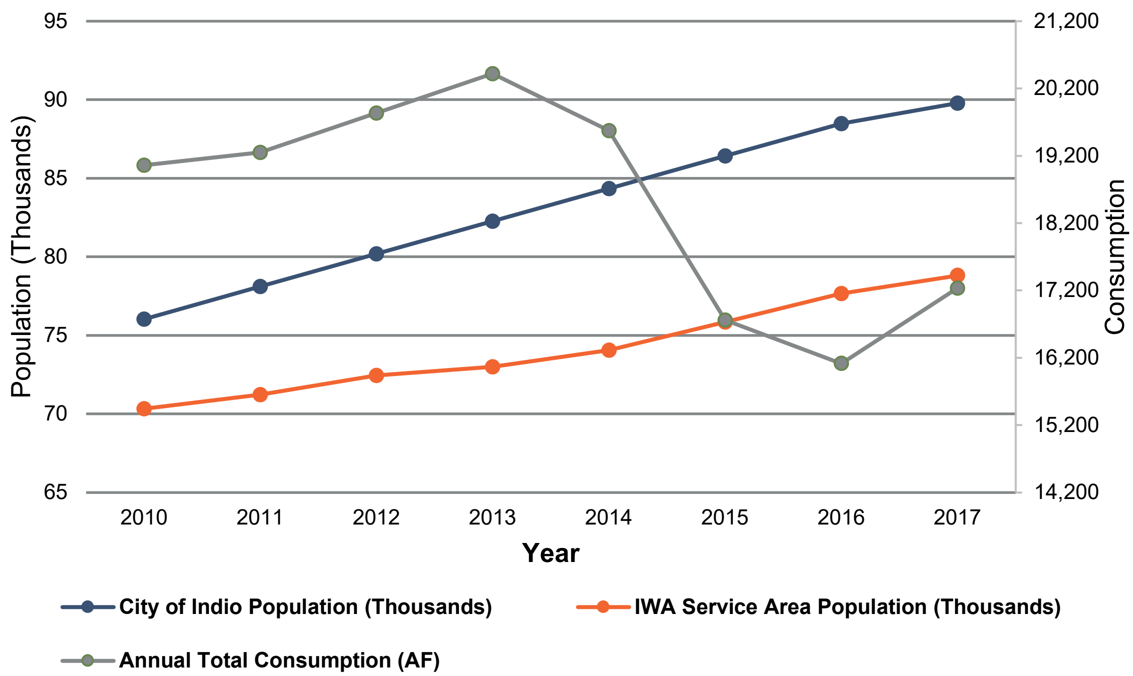



**Figure 3-5: Historical Population**

To develop future demand projections, a series of historically based projections (HBPs) were developed by deriving population growth rate slopes from the year 2016, going back in intervals of three, five and seven years. As shown in Figure 3-6, the short-term 3-year projection represents faster growth rate, while the long-term 7-year projection indicates a more modest growth rate. The 7-year HBP, as shown in Figure 3-7, was selected as it is more reflective of IWA's expectations for growth and is more consistent with the City's planning for population growth. This projection corresponds to an annual growth rate of approximately 1.4 percent.

This WMP was conducted concurrently with the creation of the 2019 City of Indio General Plan (GP) . While the GP uses an average projection value derived from 2015 employment growth, this WMP uses the historical population derivation described above in this section. Additionally, while the GP uses the City of Indio as its population area, this WMP uses a service area population derived from IWAs meter connection history. Although a different approach was used, and different areas were considered, the percent growth projection from the WMP is within 0.2 % of the GP. The purpose of the population projection in this WMP is to derive a demand projection range, as described in section 3.2.4.

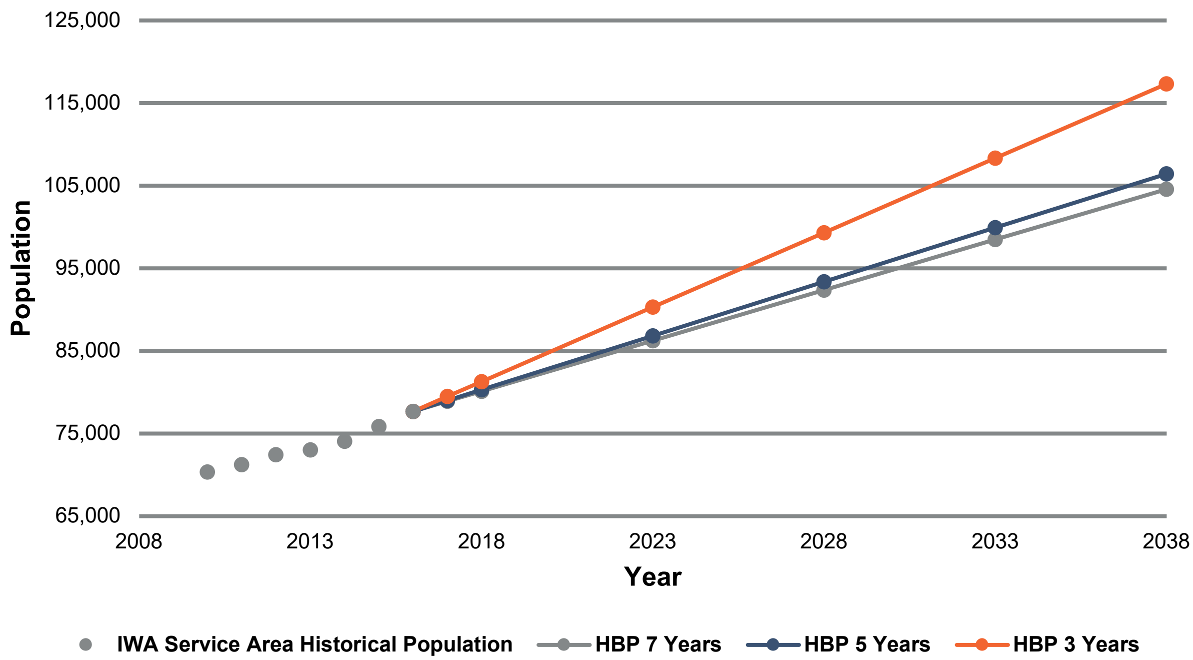



**Figure 3-6: Historically Based Projections - Comparison**

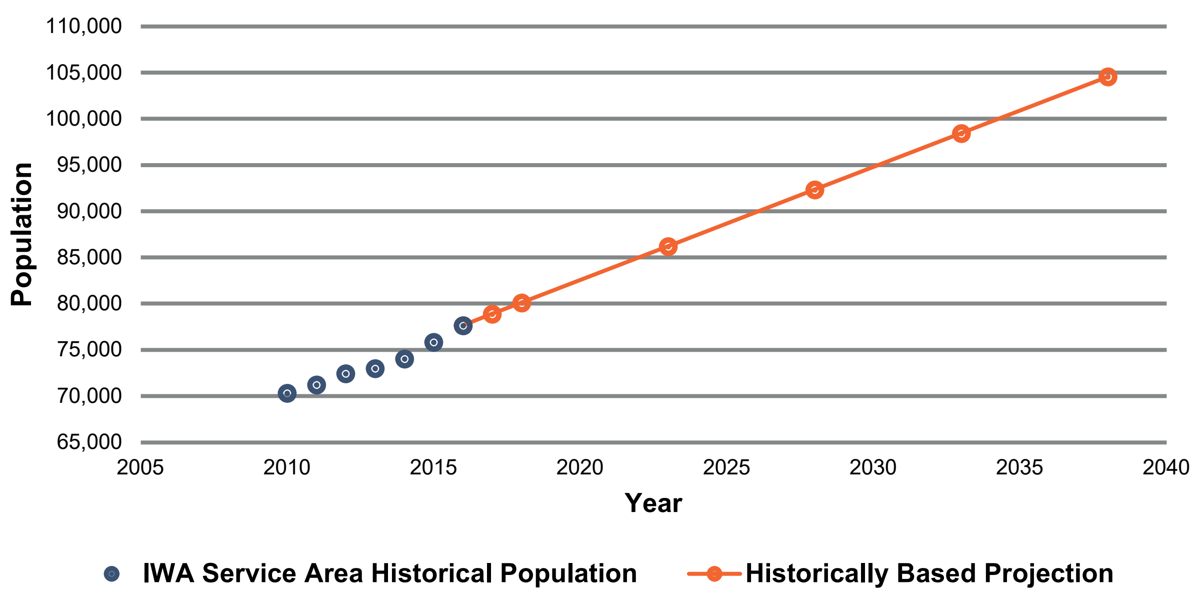



**Figure 3-7: Historically Based Projection**

### 3.2.2 Planned Developments

As discussed in Section 2, IWA is tracking approximately 20 proposed single and multi-family residential small to mid-size developments. Due to the uncertainty of development status, demand, and timeframe, future demands due to these proposed developments are assumed to occur evenly across the distribution system in accordance with the overall population and demand growth rate established in this section. For the large specific plan developments, demands have been estimated based on the land uses in Section 2 and water demand planning factors in Section 6.

#### *3.2.2.1 Citrus Ranch*

For the purposes of this Master Plan, it is assumed that Citrus Ranch will be 75 percent developed by 2028 and 100 percent developed by 2033. A summary of the Citrus Ranch demand projections is presented in Table 3-4. These demands are based on the 2006 Draft Water Supply Assessment. It is noted that a Water Supply Assessment and Verification was prepared in 2012, which had estimated a lower project average day demand of 1,666 gpm; however, the higher demand projection from the 2006 Draft Water Supply Assessment was used to generate a more conservative scenario. Golf course irrigation was proposed to be provided by an irrigation well and therefore is not included in these projections.

**Table 3-4: Citrus Ranch Demand Projections**

| Demand Condition | 75% Developed (2028) | 100% Developed (2033) |
|---|---|---|
| Average Day Demand | 1,862 gpm (2.68 MGD[1]) | 2,475 gpm (3.56 MGD) |
| Maximum Day Demand | 2,793 gpm (4.02 MGD) | 3,712 gpm (5.35 MGD) |
| Peak Hour Demand | 5,585 gpm (8.04 MGD) | 7,424 gpm (10.69 MGD) |

[1] Million Gallons per Day

Source: Citrus Ranch Residential Development. Draft Water Supply Assessment, SB 610 and SB 221. October 19, 2006. Stantec Consulting, Inc.

It is assumed that the maximum fire-flow requirement will correspond to commercial land use at 3,000 gpm for 3 hours. See Section 6 for fire-flow criteria.

Based on the location of the proposed development and backbone water system proposed in the 2007 Specific Plan, it is assumed that Citrus Ranch will require service off of the existing Terra Lago pressure zone.

For pipeline sizing purposes only, to avoid near-term upsizing or the construction of parallel pipelines, it is assumed that the entire Citrus Ranch demand will occur in 2028.

#### *3.2.2.2 Stonewater*

An estimate of water demands of the proposed development has been made for the purposes of this master plan based on the planning criteria herein. See Table 3-5. Demand estimates should be updated as the project planning is finalized.

**Table 3-5: Stonewater Land Use and Demand Estimate**

| Land use | Area (ac)[1] | Classification | Planning Demand Factor (gpd/ac) | ADD (gpm) | MDD (gpm) |
|---|---|---|---|---|---|
| Undevelopable | 13.68 | - | - | - | - |
| Restricted Use | 59.66 | - | - | - | - |
| Utility Easements | 32.1 | - | - | - | - |
| Reservoir Sites | 6 | - | - | - | - |
| R.O.W. | 10.28 | - | - | - | - |
| Hillside Areas / Open Space or Recreation Amenity | 19.46 | - | - | - | - |
| Drainage Facilities | 50.3 | - | - | - | - |
| Parks and Trails | 25 | Landscape Irrigation | 500 | 9 | 14 |
| Internal Collector Roads | 36.36 | - | - | - | - |
| Resort Hotel and Condominiums | 25 | Commercial/ Institutional | 1,160 | 20 | 32 |
| Retail / Commercial | 25.26 | Commercial/ Institutional | 1,160 | 20 | 33 |
| Motor Coach Resort / Commercial | 62.04 | Commercial/ Institutional | 1,160 | 50 | 80 |
| Multi-Family Rental Condominiums | 15 | Multi-family Residential | 6,140 | 64 | 102 |
| Single Family Residential | 438.01 | Single Family Residential | 1,660 | 505 | 808 |
| **TOTAL** | **818.15** | **-** | **-** | **668** | **1,069** |

[1] Source: RoBott Land Company Exclusive Offering Memorandum. Retrieved September 18, 2018.

It is assumed that the maximum fire-flow requirement will correspond to commercial land use at 3,000 gpm for 3 hours.

Based on the location of the proposed development, it is assumed that Stonewater will require service off of the existing Terra Lago pressure zone and will share a water supply transmission main with the Citrus Ranch development.

For pipeline sizing purposes only, to avoid near-term upsizing or the construction of parallel pipelines, it is assumed that the entire Stonewater demand will occur in 2028.

#### *3.2.2.3 Dillon Trails*

An estimate of the land use breakdown and corresponding demands is presented in Table 3-6 for the purposes of this master plan. Demand estimates should be updated as the project planning is finalized.

**Table 3-6: Dillon Trails Land Use and Demand Estimate**

| Land use | Area (ac) | Classification | Water Demand Factor (gpd/ac) | ADD (gpm) | MDD (gpm) |
|---|---|---|---|---|---|
| Low Density Residential | 125.17 | Single Family Residential | 1,660 | 144 | 231 |
| Medium Density Residential | 24.11 | Multi-family Residential | 6,140 | 103 | 164 |
| Commercial | 1.10 | Commercial/Institutional | 1,160 | 1 | 1 |
| Open Space | 31.79 | Landscape Irrigation | 500 | 11 | 18 |
| Right-of-Way | 27.83 | - | - | - | - |
| **TOTAL** | **210** | | | **259** | **414** |

It is assumed that the maximum fire-flow requirement will correspond to commercial land use at 3,000 gpm for 3 hours.

Based on the location of the proposed development, it is assumed that Dillon Trails will require service off of the existing Terra Lago pressure zone and will share a water supply transmission main with the Citrus Ranch and Stonewater developments.

For pipeline sizing purposes only, to avoid near-term upsizing or the construction of parallel pipelines, it is assumed that the entire Dillon Trails demand will occur in 2028.

#### *3.2.2.4 Dillon Ranch*

An estimate of the land use breakdown and corresponding demands is presented in Table 3-7 for the purposes of this master plan. Demand estimates should be updated as the project planning is finalized.

**Table 3-7: Dillon Ranch Land Use and Demand Estimate**

| Land use | Area (ac) | Classification | Water Demand Factor (gpd/ac) | ADD (gpm) | MDD (gpm) |
|---|---|---|---|---|---|
| Medium Density Residential | 64.20 | Multi-family Residential | 6,140 | 274 | 438 |
| Commercial | 11.98 | Commercial/Institutional | 1,160 | 10 | 15 |
| Open Space | 29.94 | Landscape Irrigation | 500 | 10 | 17 |
| Right-of-Way | 2.87 | - | - | - | - |
| **TOTAL** | **109** | | | **294** | **470** |

It is assumed that the maximum fire-flow requirement will correspond to commercial land use at 3,000 gpm for 3 hours.

Based on the location of Dillon Ranch, it is assumed that service off of the existing Terra Lago pressure zone will be required and will share a water supply transmission main with the Citrus Ranch, Stonewater, and Dillon Trails developments.

For pipeline sizing purposes only, to avoid near-term upsizing or the construction of parallel pipelines, it is assumed that the entire Dillon Ranch demand will occur in 2028.

### 3.2.3 Mutual Water Consolidations

IWA currently has approved plans for the Boe Del Heights and Waller Tract consolidation. Riverdale Estates & RV Resort and Carver Mutual Water are two additional mutual water companies located within IWA's service area boundary that could also potentially be consolidated within the planning horizon. Planning-level estimates of water demands that will be added to IWA's system are listed in Table 3-8. These values should be compared against actual use records as available during consolidation final design. As estimated, these demands represent approximately one percent of existing IWA demands and are not anticipated to have a significant impact on the distribution system. For the Master Plan hydraulic modeling purposes, these demands have not been point-loaded as it is assumed that the population-based demand projection will account for these demands when consolidated.

**Table 3-8: Mutual Water Companies**

| Mutual Water Company | Area (ac) | Classification | Water Demand Factor (gpd/ac) | ADD (gpm) | MDD (gpm) |
|---|---|---|---|---|---|
| Waller Tract | 25.67 | Single Family Residential | 1,660 | 30 | 47 |
| Boe Del Heights | 40.09 | Single Family Residential | 1,660 | 46 | 74 |
| Riverdale Estates & RV Resort | 40.09 | Single Family Residential | 1,660 | 46 | 74 |
| Carver Mutual Water | 35.92 | Single Family Residential | 1,660 | 41 | 66 |
| **TOTAL** | **142** | **-** | **6,640** | **163** | **262** |

### 3.2.4 Projected Demands

In summary, 2015/2016 production was used to calculate an existing drought-impacted demand of 204 gpcd as the lower demand projection envelope limit, with the upper limit set at the SB X7-7 2020 target of 262 gpcd (an increase of approximately 78 percent). These per-capita demand factors were applied to the 7-year HBP from 2018 to 2038 in 5-year increments to cover the 20-year planning horizon. The purpose of the demand projection envelope is to allow IWA to plan for improvements in case per-capita demands rise post-drought, but implement improvements based on actual demand growth. See Figure 3-8 and Table 3-9.

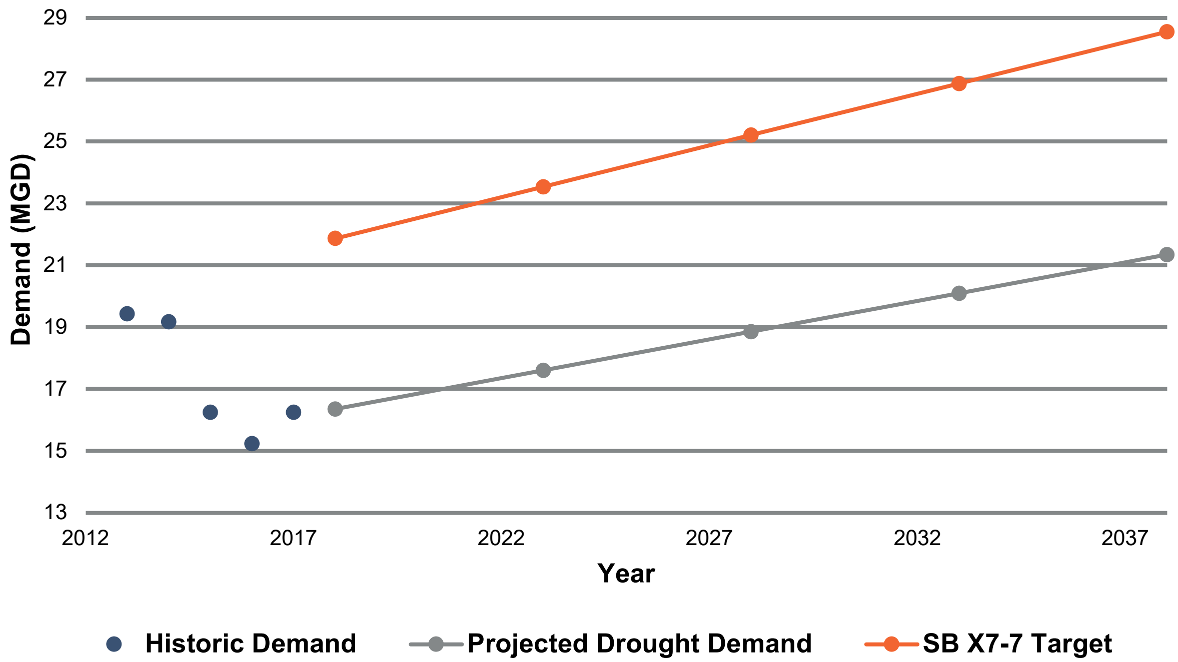



**Figure 3-8: Historic Demands, Projected Drought and Non-Drought Demands**

**Table 3-9: Historic Demands, Projected Drought and Non-Drought Demands**

| Year | Historic Demand (MGD) | Projected Drought Demand (MGD) | SB X7-7 Target (MGD) |
|---|---|---|---|
| 2013 | 19.44 | | |
| 2014 | 19.17 | | |
| 2015 | 16.26 | | |
| 2016 | 15.24 | | |
| 2017 | 16.25 | | |
| 2018 | | 16.35 | 21.87 |
| 2023 | | 17.60 | 23.54 |
| 2028 | | 18.85 | 25.21 |
| 2033 | | 20.10 | 26.88 |
| 2038 | | 21.35 | 28.55 |

Demands for Specific Plan projects currently outside the IWA service area boundary were allocated by point-loading the hydraulic model at the anticipated connection point of the existing system. Demands were phased in to the planning period based on an estimated 400 dwelling units constructed per year. As shown in Table 3-10, these demands were offset from the total system projections to avoid double counting.

**Table 3-10: Specific Plan Projected MDD**

| Maximum Day Demands (gpm) | | | | | |
|---|---|---|---|---|---|
| **Specific Plan** | **2018** | **2023** | **2028** | **2033** | **2038** |
| Citrus Ranch | 0 | 0 | 2,793 | 3,712 | 3,712 |
| Stonewater | 0 | 0 | 0 | 534.5 | 1,069 |
| Dillon Trails | 0 | 0 | 0 | 0 | 414 |
| Dillon Ranch | 0 | 0 | 0 | 0 | 470 |
| **TOTAL** | **0** | **0** | **2,793** | **4,246.5** | **5,665** |

# 4. Water Supply

IWA is currently 100 percent reliant upon groundwater supply to meet its demand. As IWA's demand continues to increase and groundwater regulations increase, it is important to diversify a supply portfolio to support the future growth of the City. This section describes IWA's current supply sources and examines IWA's potential supply strategy for the 20-year planning horizon.

## 4.1 Existing Supply

### 4.1.1 Groundwater

The Coachella Valley Groundwater Basin (7-21) extends from the San Gorgonio Pass to the Salton Sea and consists of the Indio (7-21.01), Mission Creek (7-21.02), Desert Hot Springs (7-21.03), and San Gorgonio Pass (7-21.04) Subbasins. The Indio Subbasin consists of the Upper (West) and Lower (East) Whitewater River Subbasins as identified by Coachella Valley Water Groundwater Management Plan. IWA's existing service area predominantly overlies the East Whitewater River Subbasin with a small portion in the northeast overlying the Desert Hot Springs Subbasin. The proposed expansion to IWA's service area predominantly overlies the Desert Hot Springs Subbasin with small portions overlying the Mission Creek and Whitewater River Subbasins (refer to Exhibit 4-1).

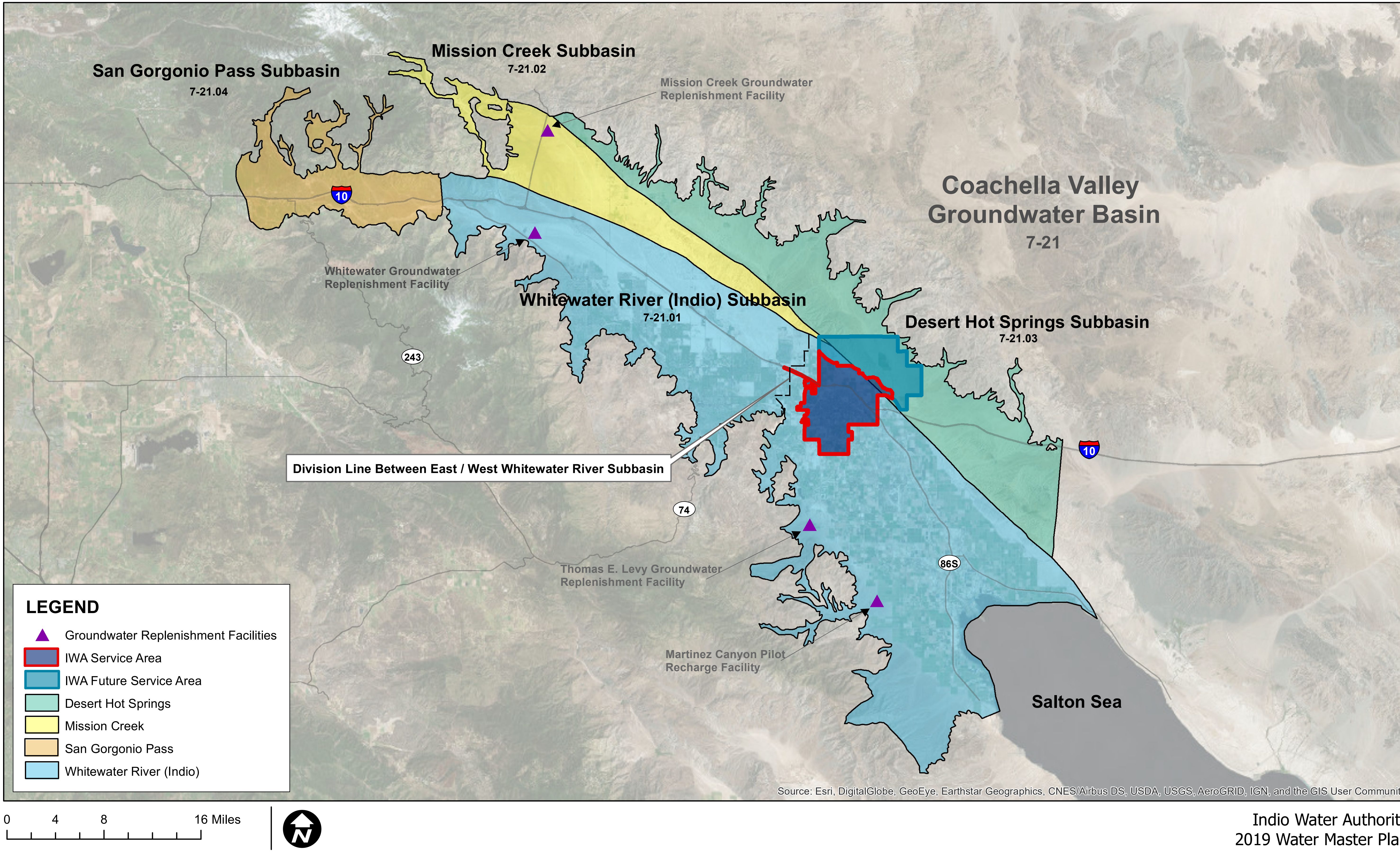
Table 4-1 presents IWA's cost to deliver water.

**Table 4-1: Groundwater Pumping Costs**

| Cost | Cost ($/AF) |
|---|---|
| Operating Costs | $163 |
| Replenishment Assessment Charge | $66 |
| **TOTAL** | **$229** |

Notes:

1. Operating costs were taken from the IWA's Water Audit performed in FY 2017-2018.
2. The replenishment assessment charge (RAC) increased to $73 in July 2018.




Indio Water Authority
2019 Water Master Plan

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Exhibit 4-1
Groundwater Basins

The Whitewater River Subbasin is unadjudicated and is managed based on 2012 Coachella Valley Water Management Plan. In 1964, DWR estimated a total storage capacity of 29,800,000 acre-feet above a depth of 1,000 feet bgs. Due to historically declining groundwater levels and the Whitewater River Subbasin being in a state of overdraft, CVWD and DWA manage the Whitewater River Subbasin. For groundwater management purposes, CVWD divides the Whitewater River Subbasin into two areas: The Upper (or West) Whitewater River Subbasin Area of Benefit (AOB) and the Lower (or East) Whitewater River Subbasin AOB with the dividing line being an irregular northeast to southwest trending line from the Indio Hills to Point Happy in La Quinta. CVWD and DWA jointly manage the West AOB, operating the Whitewater River Spreading Facility where Colorado River water that has been received in exchange for State Water Project (SWP) water rights is recharged. The East AOB is managed by CVWD where Colorado River water is recharged in the Indio Subbasin at the Thomas E. Levy Groundwater Replenishment Facility.

All IWA's existing production wells are located within the East AOB of the Whitewater River Subbasin (see Section 5 for more detailed information on IWA wells). Non-exempt groundwater producers[1] pay CVWD's Replenishment Assessment Charge (RAC) to partially fund CVWD's Groundwater Replenishment Program (GRP). The East Whitewater River Subbasin AOB RAC is recommended to be levied at $73 per acre-foot of water pumped effective July 1, 2018[2]. According to CVWD's 2018-2019 Engineer's Report on Water Supply and Replenishment Assessment, groundwater storage in the East Whitewater River Subbasin AOB has steadily increased in the past 10-year period from 2007 to 2017 with the exception of 2017 where a decrease in storage was observed due to reduced Colorado River water deliveries as a result of the Coachella Canal Lining Project.

Although the Whitewater River Subbasin is unadjudicated, IWA has a goal of not exceeding 20,000 acre-feet of pumped groundwater per year by 2025 based on interagency agreements as indicated in the 2015 UWMP.

Primary constituents of concern in the Whitewater River Subbasin include total dissolved solids (TDS) and nitrates, although neither constituent has been detected at levels requiring treatment. Naturally occurring hexavalent chromium is also present in the basin. While the Superior Court of Sacramento County issued a judgement on May 31, 2017 invalidating the hexavalent chromium maximum contaminant level (MCL) of 10 parts per billion (ppb), the SWRCB has been ordered to adopt a new MCL. Meanwhile, the state MCL for total chromium of 50 ppb will remain in place. The uncertainty of the hexavalent chromium MCL presents some uncertainty based on the future costs of treatment for the continued supply from groundwater. The groundwater quality in the Desert Hot Springs Subbasin is generally undesirable for potable water or agricultural purposes due to high TDS, sodium and sulfate ions, and high temperatures.

## 4.2 Future Supply Sources

Potential future supply sources other than groundwater include recycled water, stormwater, surface water from the Coachella Canal, and imported water from Cadiz, Inc. (Cadiz) or the Metropolitan Water District

[1] Groundwater pumpers that pump more than 25 acre-feet of water from the aquifer in any year.
2 CVWD's 2018-2019 Engineer's Report on Water Supply and Replenishment Assessment

of Southern California (MWD). Required improvements and logistics along with estimated unit water costs for each source is provided.

### 4.2.1 Recycled Water

IWA has extensively studied the potential for recycled water use as a means of diversifying its supply portfolio beginning in the 2007 Water Master Plan, followed in more detail with a recycled water market assessment and delivery options study in 2010 and Recycled Water Master Plan (RWMP) in 2011. In 2013, the East Valley Reclamation Authority (EVRA) was created under a joint powers agreement between the City of Indio through IWA and Valley Sanitary District (VSD) to plan, implement, and operate a recycled water program. Further studies included a feasibility study for the Bureau of Reclamation Title XVI program in 2016 and most recently a regional recycled water program development feasibility study in 2018.

The 2011 RWMP had initially identified potential recycled water demand of up to 15,974 AFY, not including the Citrus Ranch, Stonewater, Dillon Ranch, and Dillon Trails proposed developments. The recycled water demand was later scaled back to 9,243 AFY in the 2016 Recycled Water Feasibility Study to more closely match the limitation of flows projected to be available for recycled water production at the VSD Water Reclamation Facility (WRF). The 2016 study assumed that the recycled water would be for direct non-potable use with the option of injecting excess flows. The phasing of recycled water use, as presented in the 2015 UWMP, is listed in Table 4-2.

**Table 4-2: Projected Recycled Water Use**

| Use Type | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Landscape irrigation (excludes golf courses) (AF) | 0 | 50 | 120 | 1,080 | 2,300 | 3,220 |
| Golf Course Irrigation (AF) | 0 | 960 | 2,240 | 4,050 | 5,180 | 6,030 |
| **TOTAL** | **0** | **1,010** | **2,360** | **5,130** | **7,480** | **9,250** |

Source: 2015 Indio Water Authority Urban Water Management Plan

An aquitard covering much of the City of Indio identified in geological and geohydrological studies may prevent recharge via spreading from reaching the lower aquifer in much of the City of Indio; therefore, IWA's options are likely limited to either direct non-potable use or deep well injection for storage.

Costs from the 2018 Recycled Water Program Development Feasibility Study TM-1 range from $1,127/AF for injection at VSD to $1,141 for recycled water distribution and sending the excess to the CVSC.

### 4.2.2 Surface Water

Surface water from the Colorado River is brought to the Imperial and Coachella Valleys by the Colorado River Aqueduct (CRA) and the Coachella Canal, a branch of the All-American Canal. The CRA begins at Parker Dam at Lake Havasu and delivers water to the Whitewater River and Mission Creek spreading grounds, terminating at Lake Matthews. The All-American Canal begins at the Imperial Dam located northeast of Yuma, Arizona, running parallel to the United States-Mexico border. The Coachella Canal begins at Drop 1 of the All-American Canal, running northwest through the Imperial and Coachella Valleys, terminating at Lake Cahuilla in La Quinta. CVWD manages the Coachella Canal and owns rights to the Colorado River water (CRW).

Currently, the Coachella Canal serves agricultural, golf course irrigation, commercial, and recreational lake uses. CVWD has been implementing a source substitution program including the Mid-Valley Pipeline and conversion of agricultural users and golf courses from groundwater pumping to Canal water for irrigation. A preliminary study of treatment of Canal water for potable use has also been performed by CVWD.

The Coachella Canal runs through the IWA service area, it may be a feasible source for raw surface water to be treated for potable distribution. In 2010, IWA conducted a conceptual design report for a surface water treatment facility at Posse Park for potable use and groundwater recharge. Posse Park is a roughly 20-acre site owned by the City of Indio on Avenue 42 at Golf Center Parkway that is located directly adjacent to the Coachella Canal. The 2010 report estimated a unit treated water cost of $493 per acre-foot for the first phase of 10 MGD and $465 per acre-foot for the second phase of 14 MGD. Design and construction were estimated to take just over 2.5 years. An initial study / environmental assessment for the project was prepared in 2012, although the project has not been implemented to date.

Due to the proximity of infrastructure, relatively low cost, and fact that the City already owns the necessary land, this is a highly feasible alternative assuming an agreement can be made with CVWD to purchase CRW.  Given the low cost of purchased water and the increasing cost of the RAC.  Surface water cost per acre-foot will become more feasible.

IWA also conducted a geologic and hydrogeologic investigation in 2009 (Petra Geotechnical, Inc.) which found that surface spreading at Posse Park would be infeasible due to the presence of a clay layer preventing the recharge of the lower aquifer.

With the potential of future droughts and declining levels in Lake Mead, allocations may decrease as necessary to maintain levels in the lake.  The uncertainty of supply is a clear risk to this option.

Other potential surface water sources such as desalinated agricultural drain water or desalinated ocean water are not being considered due to the minimal amount of potential supply, distance, and cost of treatment.

### 4.2.3 Metropolitan Water District

The Metropolitan Water District of Southern California (MWD) is a regional wholesaler that delivers water to agencies within the Ventura, Los Angeles, Orange, San Bernardino, Riverside, and San Diego Counties. MWD's two main imported water sources include the Sacramento and San Joaquin Rivers through the State Water Project (SWP) and the Colorado River through the Colorado River Aqueduct.

There are currently no existing facilities capable of wheeling MWD SWP water supplies into the Coachella Valley region. For that reason, CVWD and DWA exchange SWP water rights for Colorado River Water. While MWD, CVWD, and DWA have studied the feasibility of extending the California Aqueduct to deliver SWP supplies to the Coachella Valley, capital costs associated with an aqueduct extension may be prohibitive (CVRWMG 2014 IRWMP). The California Aqueduct begins at the Harvey O. Banks Pumping Plant at the Sacramento-San Joaquin Delta extending down to Lake Perris.

CVWD and DWA have considered the feasibility of providing SWP water supplies to the Coachella Valley with a 99-mile pipeline delivering up to 300 cfs peak capacity from the California Aqueduct in Apple Valley to two recharge/spreading basins referred to as the Desert Aqueduct (2007 MSWD Water Recycling Feasibility Study). A total unit cost of $1,036 per acre-foot was estimated in this study for recycled water delivery to MSWD customers.

Additional costs may be required to treat to potable distribution and convey to the IWA service area. The current rate structure from MWD is summarized in Figure 4-1 from the FY2017/18 Rate Structure Administrative Procedures Handbook, Table 1.

| Effective January 1st | 2016 | 2017 | 2018 |
|---|---|---|---|
| Tier 1 Supply Rate ($/AF) | $156 | $201 | $209 |
| Tier 2 Supply Rate ($/AF) | $290 | $295 | $295 |
| System Access Rate ($/AF) | $259 | $289 | $299 |
| Water Stewardship Rate ($/AF) | $41 | $52 | $55 |
| System Power Rate ($/AF) | $138 | $124 | $132 |
| Full Service Untreated Volumetric Cost ($/AF) | | | |
| Tier 1 | $594 | $666 | $695 |
| Tier 2 | $728 | $760 | $781 |
| Treatment Surcharge ($/AF) | $348 | $313 | $320 |
| Full Service Treated Volumetric Cost ($/AF) | | | |
| Tier 1 | $942 | $979 | $1,015 |
| Tier 2 | $1,076 | $1,073 | $1,101 |
| Readiness-to-Serve Charge ($M) | $153 | $135 | $140 |
| Capacity Charge ($/cfs) | $10,900 | $8,000 | $8,700 |

**Figure 4-1: MWD Rate Structure**

Due to the high capital cost and extensive conveyance infrastructure required to convey water from the turnout of the CRA to a point in Indio, the option is a less feasible supply source.

### 4.2.4 Cadiz Valley Water Conservation, Recovery and Storage Project

The Cadiz Valley Water Conservation, Recovery and Storage Project (Cadiz Water Project) is a public-private partnership between Cadiz, Inc. and the Santa Margarita Water District (SMWD) that will provide a new water supply source to Southern California. The project proposes to capture groundwater in the Cadiz Valley supplied by runoff from the surrounding mountains that would otherwise be lost to evaporation in the Bristol and Cadiz Dry Lakes. The project will include a wellfield in Cadiz for groundwater extraction and a 43-mile pipeline from the wellfield to the CRA where the water can then be supplied to project participants. The project also plans to have a conjunctive use component where water during wet years can be stored in the Cadiz Valley and later extracted. According to Cadiz, the total quantity of groundwater to be recovered and conveyed to project participants will not exceed a long-term annual average of 50,000 acre-feet per year, and the long-term average recharge rate is estimated to be 32,000 acre-feet per year.[3]

For IWA to access this water source, a connection to the CRA would be required. The CRA is located approximately 10 miles north of the IWA service area, running in a northwesterly direction largely via tunnels through the San Bernardino Mountains. An alternative would be an exchange agreement where Cadiz volumes are exchanged for CRW in the Coachella Canal. The price of Cadiz water is estimated at $960 per acre-foot, which does not include the cost of any additional infrastructure to bring the water to IWA. Six agencies have either executed a purchase agreement or have option agreements including the Santa Margarita Water District, Three Valleys Municipal Water District, Suburban Water Systems, Golden State Water Company, Jurupa Community Services, California Water Service Company. A letter of intent has also been executed with the Lake Arrowhead Community Service District for the reservation of 3,000 AFY of the 20 percent of 50,000 AFY total that Cadiz has reserved for the future needs of San Bernardino County-based agencies.

## 4.3 Salt Nutrient Management Plan Evaluation

The Coachella Valley Groundwater Basin Salt Nutrient Management Plan (CVSNMP) was completed in May 2015 for the Coachella Valley Water District, Desert Water Agency, and Indio Water Authority. The CVSNMP was received and filed by the Indio Water Authority Board on June 2, 2015. The plan identified that the estimated salt and nutrient loading modeling results indicate that the average concentrations of total dissolved solids (TDS) and nitrate ($NO_3$) are not anticipated to exceed the Water Quality Control Plan for the Colorado River Basin (Basin Plan) for Region 7 Water Quality Objective (WBO) for nitrate or TDS criterion. Furthermore, the modeling indicated that the water quality from planned recycled water projects will not deviate from the plan over the next 30 years water management planning period.

According to the CVSNMP, the ambient water quality for the groundwater from the East Whitewater River management zone was 515 mg/L for TDS and 7.0 mg/L Nitrate as $NO_3$. The Water Quality Criterion was set at 1,000 mg/L for total dissolved salt (TDS) based on Title 22 CCR “consumer acceptance for municipal beneficial use”. While the criterion set at 1,000 mg/L is acceptable for water quality in municipal drinking water, it may not be accepted by the Regional Water Quality Control Board for the Indio Groundwater Basin. For example, the Santa Ana Regional Water Quality Control Board set the Beaumont Basin TDS at 350 mg/L. Officially, the Colorado River Regional Water Quality Control (Colorado River RWQCB) Board has not set a limit based on historical levels for TDS before replenishment started. It should be noted that the IWA Board have received and filed the Coachella Valley Salt Nutrient Management Plan, but the IWA Board has taken no action on it. Regionally, the Colorado River RWQCB has included in the special provisions of discharge permits for various local wastewater treatment plants for a study on the plants to remove nitrogen and salts from their discharges.

[3] http://www.cadizinc.com/faq/

The inclusion of these special provisions could be potential indication that staff at the Board are looking to develop a TDS limit for the basin.

A determination of the historical TDS levels could have a significant impact on the current replenishment system for the Coachella Valley. If treatment of TDS is required to levels found acceptable by the Water Board, the costs for replenishment could significantly rise. The changes would have a significant impact of the Replenishment Assessment Charge (RAC) to all groundwater pumpers in the Coachella Valley, including IWA.

## 4.4 Sustainable Groundwater Management Act (SGMA) Evaluation

Groundwater sustainability can be an advantage to IWA to pursue recycled water to either supplement or offset its water supply portfolio. As a groundwater sustainability agency (GSA), IWA can charge customers for developing the necessary funds to create projects that will help improve the sustainability of the groundwater basin. Projects could include recycled water with spreading or injection. Currently, CVWD has not been able to show improvement in the groundwater basin overlying Indio. A recycled water project would be beneficial to IWA from the standpoint of reducing the amount of pumping or offsetting the groundwater by returning it to the basin in some fashion. It is important to note that fees for groundwater sustainability are not required to go through the Proposition 218 process due to the fact that it has been established through the State Legislature.

## 4.5 Water Conservation and Efficiency Statutes

IWA needs to be prepared for ensuring compliance with Assembly Bill (AB) 1668 and Senate Bill (SB) 606, which were enacted on May 31, 2018. These bills mandate the water efficiency and conservation for water retail suppliers like IWA. Building on Governor Brown's ongoing efforts to make water conservation a way of life in California, SB 606 and AB 1668 established guidelines for efficient water use and a framework for the implementation and oversight of the new standards, which must be in place by 2022. The two bills strengthen the state's water resiliency in the face of future droughts with provisions that include:

- Establishing water use objectives and long-term standards for efficient water use that apply to urban retail water suppliers; comprised of indoor residential water use, outdoor residential water use, commercial, industrial and institutional (CII) irrigation with dedicated meters, water loss, and other unique local uses.
- Creating an indoor, per person water use goals:
    - 55 gallons per day until 2025,
    - 52.5 gallons from 2025 to 2030, and
    - 50 gallons beginning in 2030.
- Providing incentives for water suppliers to recycle water.
- Identifying small water suppliers to recycle water.
- Identifying small water suppliers and rural communities that may be at risk of drought and water shortage vulnerability and provide recommendations for drought planning.
- Requiring both urban and agricultural water suppliers to set annual water budgets and prepare for drought.

IWA currently has water budget-based rates and stands ready to implement the reductions in per capita use and outdoor irrigation. As the per capita water usage goal falls, IWA can adjust the budget tiered rates accordingly. IWA along with the other desert water agencies will have to engage the process for implementation of outdoor water use until other supply options are developed and become available to those customers.

## 4.6 Supply Strategy

The proposed water supply strategy is for IWA to continue to utilize groundwater as the predominant supply source to meet short term demand because it is the lowest cost option. However, utilizing groundwater is not sustainable in the long-term. The Indio Basin remains in overdraft; however, water levels have not declined and most recently more water was replenished into the basin versus extracted. Based on the 2015 UWMP, it shows implementing imported treated potable water and Phase 1 recycled water in 2020 to reach the goal of reducing groundwater production to 20,000 AFY by 2025. As shown in Table 4-3, the proposed solution is to add about 3,000 AF in 2023 by building the necessary tertiary treatment at VSD and Phase 1 non-potable distribution system to North Indio. Then adding approximately another 4,600 AF in Phase 2 non-potable distribution to East Indio in 2028.

**Table 4-3: Supply Availability**

| Supply | 2018 | 2023 | 2028 | 2033 | 2038 |
|---|---|---|---|---|---|
| Groundwater Production (AF) | 23,500 | 22,000 | 20,000 | 20,000 | 20,000 |
| Phase 1 Recycled (AF) | | 3,360 | 3,360 | 3,360 | 3,360 |
| Phase 2 Recycled (AF) | | | 4,625 | 4,625 | 5,890 |
| Imported Treated Potable (AF) | | | | 5,000 | 10,000 |
| **TOTAL** | **23,500** | **25,360** | **27,985** | **32,985** | **39,250** |

Recycled water recharge is a sustainable option for IWA and considered a more viable option for self-reliance and long-term sustainability. With available funding options, the possibility of lowering the overall costs for recycled water makes the option more viable from a cost perspective. If IWA and Valley Sanitary District joint powers agency East Valley Reclamation Authority can apply for funding together, regional projects have a greater likelihood of receiving funding. Furthermore, the cost per acre-foot drops with funding, and makes recycled water more economically feasible.

Employing a regional planning approach offers not only advantages in identifying long-term and integrated solutions but will also allow IWA to better plan for and leverage the use of federal and state funding programs.

Imported treated potable water has some reliability risks as  a significant component of IWA's long-term supply strategy due to increasing scarcity of water resources throughout n the Colorado River Basin.

However, if consistent annual reliability is removed from consideration and the costs of possible chromium-6 treatment are factored in, surface water treatment becomes more viable.  There are three State Water Project contractors that can supply imported water –Metropolitan Water, Coachella Valley Water District, and Desert Water Agency. Of those three suppliers, the most practical and cost-effective supplier of imported water would be CVWD. The Coachella branch of the All-American Canal runs directly through the IWA service area and there are several locations on the north side of Indio service area that could be possible options for recharge, a potable water treatment plant, or non-potable water storage ponds.

Using a planning level cost estimates for the supply options mentioned above, IWA will need to start planning now to cover these costs in the future. Below in Table 4-4 are the estimated costs for these alternative water supplies.

**Table 4-4: Supply Alternatives Cost Summary**

| Supply Alternative | Low ($/AF) | High ($/AF) |
|---|---|---|
| Cadiz | 960 | 1,500 |
| CVWD | 540 | 580 |
| Recycled | 1,127 | 1,141 |
| Metropolitan | 1,390 | 1,882 |

Note: Cadiz costs are based on information from public information and do not include capital and O&M costs. CVWD rates include the purchased raw water rate and treatment O&M costs. Metropolitan rates are based on tiers, treated and untreated water rates.

# 5. Distribution System

IWA's major water distribution system infrastructure includes groundwater wells, storage reservoirs, booster pumps, control valves, and pipelines. The distribution system consists of three pressure zones and is generally operated by having groundwater wells supply the lowest hydraulic grade line (HGL) pressure zone, which is the Main Zone. Wells pump either directly into the Main Zone controlled by system pressure setpoints, or pump into forebay tanks controlled by water level. Each forebay tank has a booster pump station to deliver water into the distribution system, either operated by a variable frequency drive (VFD) controlled by a system pressure target pressure, or constant speed controlled by system pressure set points. The Main Zone is considered a closed zone that is not floated (supplied by gravity) by an elevated tank. Additional booster pump stations are used to transfer water into the upper pressure zones (Shadow Lake and Terra Lago). This section describes the distribution system components and operation. A facilities map is provided as Exhibit 5-1 and a hydraulic schematic is provided as Exhibit 5-2.

## 5.1 Pressure Zones

A pressure zone is a geographical area of a water distribution system controlled by hydraulic boundary conditions, typically targeting a set HGL elevation such that an acceptable range of pressures is delivered for customers and fire protection. Typical boundary conditions include elevated gravity storage tank water levels, pump stations that target discharge pressure ranges or HGL ranges, and control valves, such as pressure reducing valves (PRVs) that target a downstream pressure or HGL. Pressure zones are often controlled using a combination of these types of facilities. Pressure zone boundaries are often established based on geographic elevations targeting static pressure ranges.

There are two general categories of pressure zones: "open" zones, and "closed" zones. An open zone's HGL is controlled by an elevated storage tank that "floats" or provides gravity service to its pressure zone beneath it. A closed zone is one that has no gravity storage and relies upon direct pumped supply, often supplemented by hydropneumatic tanks and VFD operated pumps.

The existing IWA distribution system consists of one large zone (Main) and two smaller zones, Shadow Lake and Terra Lago. See Table 5-1 for a summary of existing pressure zones.

**Table 5-1: Pressure Zones**

| Pressure Zone | Type | HGL (ft) | Service Elevation Range (ft amsl) |
|---|---|---|---|
| Main Zone | Closed | 200 | 40 - 80 |
| Shadow Lake | Closed | 247 | 40 - 100 |
| Terra Lago | Open | 326 | 35 - 80 |

### 5.1.1 Main Zone

The Main Zone is IWA's largest pressure zone, providing service to approximately 96 percent of the IWA service area. The Main Zone receives 100 percent of its supply from groundwater wells, which deliver supply into the zone through a combination of direct-supply wells and production plants where wells supply forebays prior to being delivered into the system by booster stations. Plants 1, 2, and 3 are also equipped with a backfill valve that allows IWA the option to fill the Plant reservoirs from the Main zone. The Main Zone is considered a closed zone, although the Lost Horse Tank does periodically deliver distribution system water to the Main Zone by providing a limited supply through a pressure reducing station that is time-controlled to operate from around 5 to 6 pm to around 8 to 9 pm. The Lost Horse Tank cannot float the Main Zone without pressure reduction because it is located at too high of an elevation and would cause excessive pressures in the Main Zone. Main Zone pumps also cannot directly feed the Lost Horse Tank due to an insufficient amount of total dynamic head (TDH).

While some direct-supply wells are equipped with VFDs, IWA operates them as constant speed pumps to avoid variability in well flows. The production plant booster stations are equipped with VFDs, which allow them to target a set HGL.

Service elevations range from approximately 80 feet above mean sea level to 40 feet below mean sea level from west to east with normal service pressures ranging from approximately 40 pounds per square inch (psi) in the west to 100 psi in the east. Pumping water levels range from 115 to 216 feet below ground surface (bgs), depending on the well location.

The Main Zone is a closed zone, and therefore, its HGL fluctuates based on demand and pump operations, and varies across the Main Zone because of its large geographical area; however, the HGL can be nominally stated at 200 feet.

Supply is drawn from the Main zone to feed the upper Shadow Lakes and Terra Lago Zones through the Shadow Lake altitude valve and the Terra Lago Booster Station.

### 5.1.2 Shadow Lake Zone

The Shadow Lake Zone serves the Shadow Lake Estates community in the northern portion of the service area. The Shadow Lake Zone receives its supply from the Main Zone through an altitude valve that fills the Shadow Lake Tank, which operates as a forebay because the tank elevation does not allow for gravity service. Water is pumped from the forebay to the Shadow Lake Zone by the Shadow Lake Booster Station. The Shadow Lake Zone is operated as a closed zone with a nominal HGL of 247 feet, although the zone HGL varies based on demand and pump operation. The Shadow Lake Booster Station is not equipped with VFDs, and instead, excess pressure/flow is bled back into the Main Zone through a Pressure Sustaining Valve (PSV).

Shadow Lake is the smallest pressure zone in the IWA distribution system, serving approximately 0.7 percent of the IWA service area. Service elevations range from approximately 40 feet Above Mean Sea Level (AMSL) in the north to 100 feet AMSL in the south. Typical service pressures range from 65 to 80 psi.

### 5.1.3 Terra Lago Zone

The Terra Lago Zone serves the Golf Club at Terra Lago, hotel, and residential communities located in the northeastern portion of the service area. The zone comprises approximately 5.9 percent of the IWA service area. The zone receives its supply from the Main Zone via the Terra Lago Booster Station, which fills the Lost Horse Tank. The Lost Horse Tank is a high-level ground storage tank, which provides gravity storage to the zone with a nominal HGL of 326 feet. Service elevations range from approximately 35 feet to 80 feet AMSL and normal service pressures range from 115 to 125 psi.

## 5.2 Reservoirs

There are seven storage reservoirs in the IWA service area. Five of these reservoirs are ground-level storage with booster pumping located at production plants, one reservoir each serving Plants 1, 2, and 4, and two reservoirs at Plant 3. The Shadow Lake Tank is also ground-level storage with booster pumping and it is the smallest tank in IWA's system. The Lost Horse Tank is high-level ground storage and is the largest tank in IWA's system. The total existing nominal storage capacity is 18.75 million gallons (MG). A summary of reservoir type, dimensions, capacities, and years of construction is provided in Table 5-2.

**Table 5-2: Existing Reservoirs**

| Pressure Zone | Facility | Reservoir Name | Type | Dimensions as LxW or Diameter (ft) | Water Height (ft) | Capacity (MG) | Year Constructed |
|---|---|---|---|---|---|---|---|
| Main | Plant 1 | Palo Verde | Above Grade Concrete | 210x145 | 22.08 | 5.0 | 2008 |
| Main | Plant 2 | Dominguez | Welded Steel | 125 | 21 | 2.0 | 1958 |
| Main | Plant 3 | Reservoir 3 | Welded Steel | 125 | 21 | 2.0 | 1977 |
| | | Reservoir 3A | Bolted Steel | 126 | 27 | 2.5 | 2009 |
| Main | Plant 4 | Reservoir 4 | Welded Steel | 125 | 23 | 2.0 | 1995 |
| Shadow Lake | Shadow Lake | Shadow Lake | Welded Steel | 40 | 24 | 0.25 | 1999 |
| Terra Lago | Terra Lago | Lost Horse | Welded Steel | 180 | 26.3 | 5.0 | 2010 |

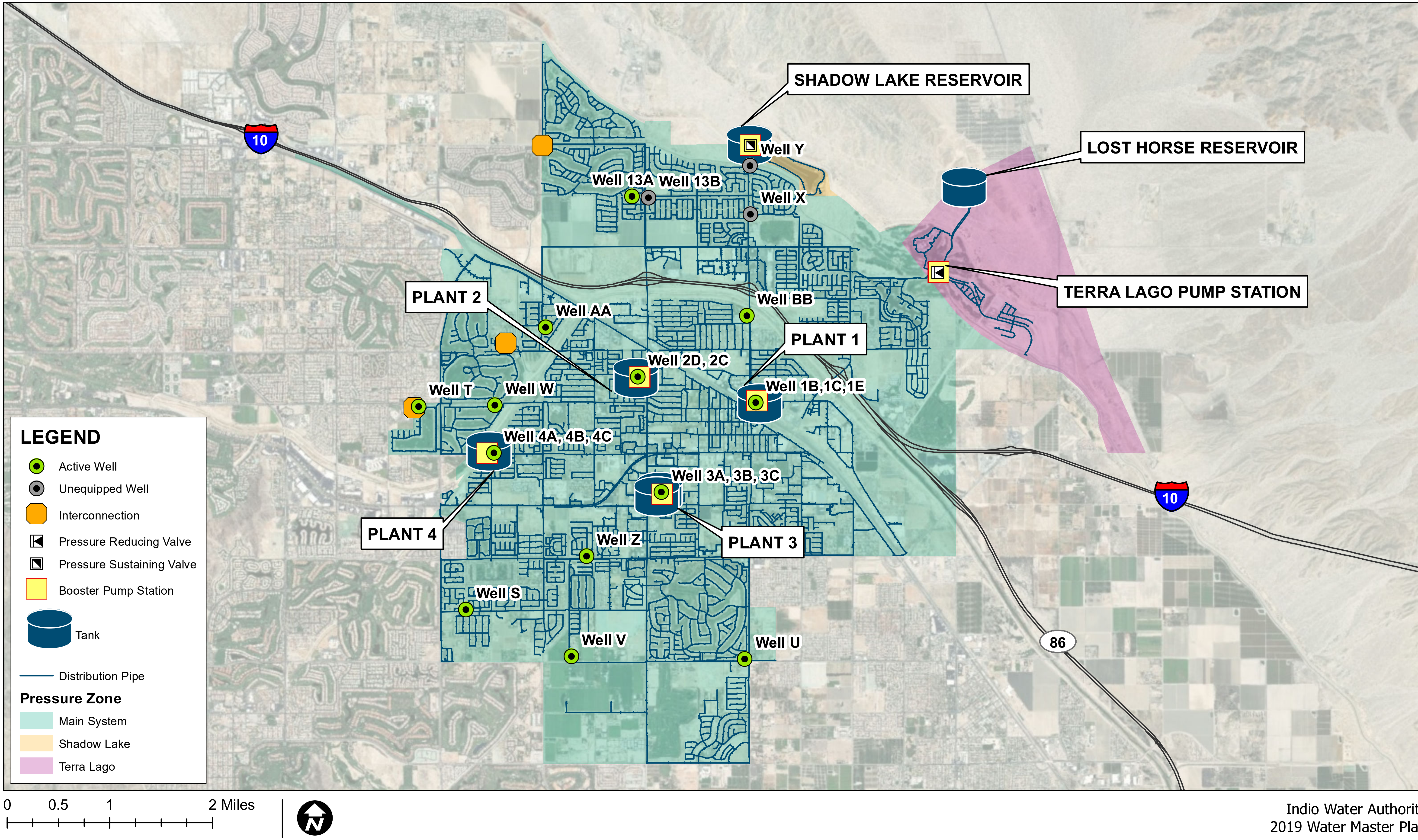


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Exhibit 5-1
Distribution System

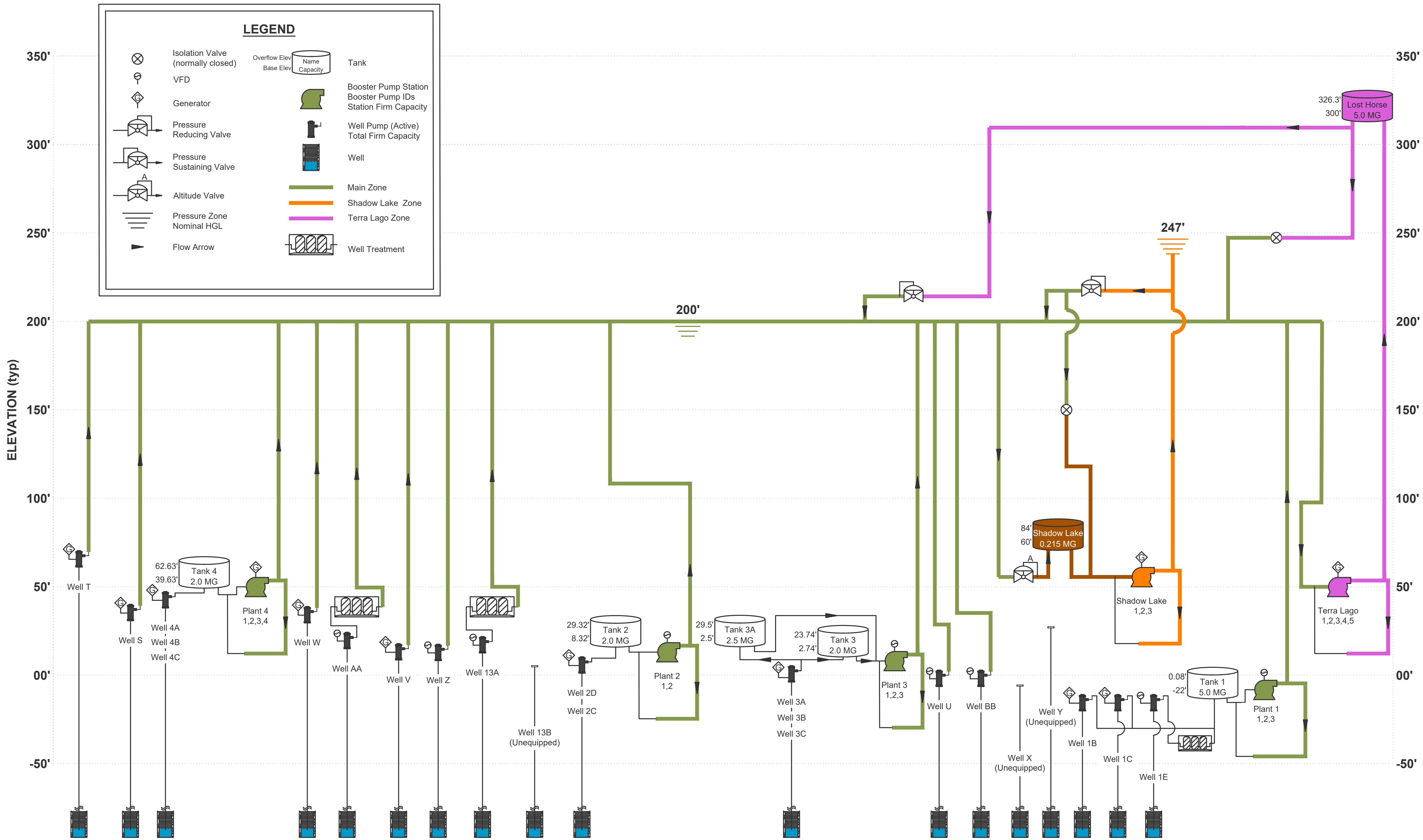


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EXHIBIT 5-2

EXISTING HYDRAULIC SCHEMATIC

## 5.3 Wells

IWA owns a total of 23 wells. Of these 23, three wells are currently unequipped. This leaves 20 active groundwater wells with a total capacity of approximately 67.8 MGD as shown in Table 5-3 and Table 5-4. Nominal capacity was conservatively estimated based on comparing record information and past pump tests. Eleven of these groundwater wells with a total nominal capacity of approximately 30.5 MGD provide water to ground level storage reservoirs at four production plants. Each production plant typically consists of a storage reservoir, booster pump station, and a surge tank. In addition, Wells 1E, AA, and 13A are equipped with ion exchange wellhead treatment. This treatment was added in 2015 to comply with the Chromium-6 MCL at the time, which has now been rescinded; however, IWA continues to operate the treatment systems while the State reevaluates the MCL.

The wells supplying these plants are controlled by water levels in their respective storage reservoir. The remaining wells supply water directly into the distribution system and are controlled by pressure set points. As mentioned previously, while some direct-supply wells are equipped with VFDs, IWA operates them as constant speed pumps to avoid variability in well flows.

**Table 5-3: Existing Active Wells**

| Facility / Pressure Zone | Name | Treatment | Nominal Capacity (gpm) |
|---|---|---|---|
| Plant 1 | Well 1B | - | 1,900 |
| | Well 1C | - | 1,150 |
| | Well 1E | IX | 3,200 |
| Plant 2 | Well 2C | - | 1,150 |
| | Well 2D | - | 2,350 |
| Plant 3 | Well 3A | - | 1,400 |
| | Well 3B | - | 1,450 |
| | Well 3C | - | 1,600 |
| Plant 4 | Well 4A | - | 2,500 |
| | Well 4B | - | 2,000 |
| | Well 4C | - | 2,450 |
| Main | Well S | - | 2,750 |
| | Well T | - | 2,900 |
| | Well U | | 2,350 |
| | Well V | - | 3,000 |
| | Well W | - | 3,200 |
| | Well Z | - | 2,300 |
| | Well AA | IX | 3,200 |
| | Well BB | - | 3,000 |
| | Well 13A | IX | 3,200 |
| | | **Total (gpm)** | **47,050** |
| | | **Total (MGD)** | **67.8** |

IX = Ion exchange treatment

**Table 5-4: Existing Inactive Wells**

| Facility / Pressure Zone | Name | Nominal Capacity (gpm) | Status |
|---|---|---|---|
| Main | Well 13B | Unknown | Unequipped |
| | Well X | Unknown | Unequipped |
| | Well Y | Unknown | Unequipped |

IWA disinfects using a 12.5 percent sodium hypochlorite solution that is injected at the well head with the exception of treated wells, when disinfection is performed at the end of the treatment process.

IWA has the opportunity to supply non-potable well water in the near future. Additionally, IWA has cited several potential future wells which are listed below in Table 5-5.

**Table 5-5: Potential Future Well Sites**

| No. | Address: | Perimeter Block Wall: | APN # | Lot Size | Blow-off Inlet: | Drilled: | Equipped: |
|---|---|---|---|---|---|---|---|
| 1 | 38500 Madison Street | No | 691-120-012 | 2.17 Ac | No | No | No |
| 2 | 42873 Della Pl | Yes | 601-650-065 | 0.51 Ac | No | No | No |
| 3 | 48250 Hjorth Street | Yes | 616-335-014 | 0.35 Ac | No | No | No |
| 4 | 48670 Monroe Street | Yes | 614-220-033-7 | 0.30 Ac | No | No | No |
| 5 | 80745 Avenue 48 | Yes | 602-030-011 | 0.48 Ac | Yes | No | No |
| 6 | 82530 Mandrone Dr | Yes | 692-130-058 | 0.29 Ac | No | No | No |
| 7 | 83422 Avenue 43 | Yes | 692-440-076 | 0.51 Ac | No | No | No |
| 8 | 83795 Avenue 43 | Yes | 692-460-079 | 0.55 Ac | Yes | No | No |
| 9 | 84276 Avenue 44 | Yes | 696-180-067 | 0.50 Ac | Yes | No | No |
| 10 | Posse Park | No | 692-040-016 | 19.58 Ac | No | No | No |
| 11 | Sun City Blvd | Yes | 691-400-020 | 0.47 Ac | No | No | No |

## 5.4 Pump Stations

IWA's booster pumping facilities are comprised of booster pumps at each of the four production plants in the Main Zone as well as the production plants in the Terra Lago and Shadow Lake Zones. The booster stations provide supply and pressure directly into the distribution system to meet normal and fire flow demands. The total firm pumping capacity in the system is 21,650 gpm, or 31 MGD.

The firm capacity is taken as the capacity of the pumping facility with the largest pump out of service with one exception: because the Shadow Lake Booster Station has a dedicated fire pump, the firm capacity is taken as the largest regular duty (non-fire-flow) pump.

See Table 5-6 for a summary of all existing pumping facilities.

**Table 5-6: Existing Pump Stations**

| Pressure Zone | Facility | Pump | Capacity (gpm) | VFD? | Total Capacity (gpm) | Firm Capacity (gpm)[1] |
|---|---|---|---|---|---|---|
| Main | Plant 1 | Pump 1 | 2,050 | Yes | 6,150 | 4,100 |
| | | Pump 2 | 2,050 | Yes | | |
| | | Pump 3 | 2,050 | Yes | | |
| | Plant 2 | Pump 1 | 1,900 | Yes | 4,250 | 1,900 |
| | | Pump 2 | 2,350 | Yes | | |
| | Plant 3 | Pump 1 | 3,150 | Yes | 9,600 | 6,350 |
| | | Pump 2 | 3,250 | Yes | | |
| | | Pump 3 | 3,200 | Yes | | |
| | Plant 4 | Pump 1 | 900 | No | 6,750 | 4,750 |
| | | Pump 2 | 1,900 | No | | |
| | | Pump 3 | 1,950 | No | | |
| | | Pump 4 | 2,000 | No | | |
| Shadow Lake | Shadow Lake | Pump 1 | 200 | No | 1,650 | 1,450 |
| | | Pump 2 | 150 | No | | |
| | | Pump 3 | 1,300 | No | | |
| Terra Lago | Terra Lago | Pump 1 | 300 | Yes | 4,350 | 3,100 |
| | | Pump 2 | 300 | Yes | | |
| | | Pump 3 | 1,250 | Yes | | |
| | | Pump 4 | 1,250 | Yes | | |
| | | Pump 5 | 1,250 | Yes | | |
| | | | | **Total** | **32,750** | **21,650** |

[1] Firm capacity equals total capacity with the largest pumping unit out of service, with the exception of Shadow Lake Pump Station, which has a dedicated fire pump.

## 5.5 Valve Stations

The IWA distribution system has two main valve stations: a pressure reducing valve (PRV) station at the Terra Lago Pump Station site that can flow from the Terra Lago Zone to the Main Zone, and a pressure sustaining valve (PSV) station at the Shadow Lake reservoir site that can flow from the Shadow Lake Zone to the Main Zone.

The purpose of the Terra Lago 8-inch PRV is twofold: 1) supplement the Main Zone pressures in the northeast during periods of high demand, and 2) help turnover the Lost Horse Tank to avoid water age issues. The Terra Lago PRV is currently on a timer control to prevent the PRV from being active while the Terra Lago booster station is operating to minimize circular pumping.

The purpose of the 3-inch PRV as indicated by IWA staff is to bleed excess pressure, maintain water quality and reduce the water temperature during the Summer season. See Table 5-7 for a summary of valve station parameters.

**Table 5-7: Existing Valve Stations**

| Station | Valve No. | Type | Diameter (in) | Suggested Continuous Flow Range (gpm)[1] | Setting (psi) |
|---|---|---|---|---|---|
| Terra Lago | PRV-1 | Pressure reducing | 4 | up to 800 | 60 |
| | PRV-2 | Pressure reducing | 6 | up to 1,800 | 59 |
| | PRV-3 | Pressure reducing | 8 | up to 3,100 | 59 |
| Shadow Lake | PRV-1 | Pressure reducing | 8 | up to 3,100 | 55 |
| | PRV-2 | Pressure reducing | 3 | up to 460 | 75 |

[1] Per manufacturer recommendation.

## 5.6 Pipelines

IWA's distribution system is comprised of approximately 336 miles of distribution and transmission piping, which conveys water from the supply sources to the storage tanks and to the customers. Pipe diameters range from 4 inches to 24 inches with the vast majority of the system made up of 6-, 8-, 10- and 12-inch pipes. Refer to Table 5-8 and Figure 5-1.

**Table 5-8: Existing Pipelines by Diameter**

| Pipe Diameter (in) | Length (ft) | Length (mi) | Percentage (%) |
|---|---|---|---|
| <=4 | 12,202 | 2.31 | 0.69% |
| 6 | 233,941 | 44.31 | 13.20% |
| 8 | 819,959 | 155.30 | 46.27% |
| 10 | 185,386 | 35.11 | 10.46% |
| 12 | 303,114 | 57.41 | 17.10% |
| 14 | 20,024 | 3.79 | 1.13% |
| 16 | 32,982 | 6.25 | 1.86% |
| 18 | 111,427 | 21.10 | 6.29% |
| 20 | 530 | 0.10 | 0.03% |
| 24 | 52,521 | 9.95 | 2.96% |
| **TOTAL** | **1,772,085** | **335.62** | **100.00%** |

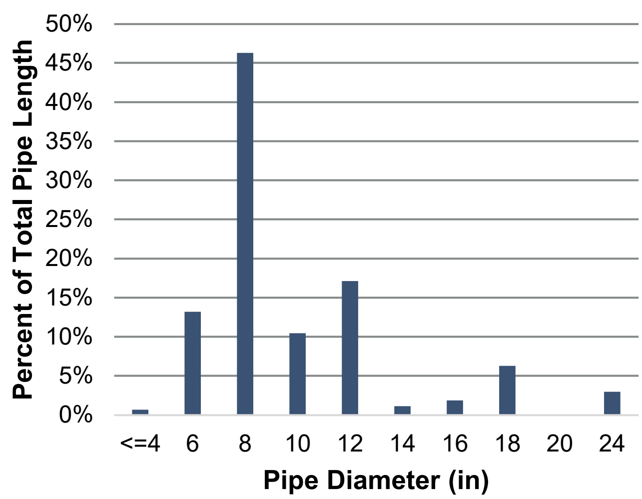


**Figure 5-1: Existing Pipelines by Diameter**

As shown in Table 5-9 and Figure 5-2, the preeminent piping materials include ductile iron pipe (DIP) and asbestos cement pipe (ACP), and to a lesser extent polyvinyl chloride (PVC).

**Table 5-9: Existing Pipelines by Material**

| Material | Length (ft) | Length (mi) | Percentage (%) |
|---|---|---|---|
| DIP | 793,008 | 150.2 | 44.75% |
| ACP | 651,243 | 123.3 | 36.75% |
| PVC | 301,566 | 57.1 | 17.02% |
| UNK | 12,097 | 2.3 | 0.68% |
| Cement Mortar | 7,752 | 1.5 | 0.44% |
| Steel | 3,881 | 0.7 | 0.22% |
| Plastic | 2,142 | 0.4 | 0.12% |
| Bar-wrapped Concrete Cylinder Pipe (CCP) | 395 | 0.1 | 0.02% |
| TOTAL | 1,772,085 | 335.6 | 100.00% |

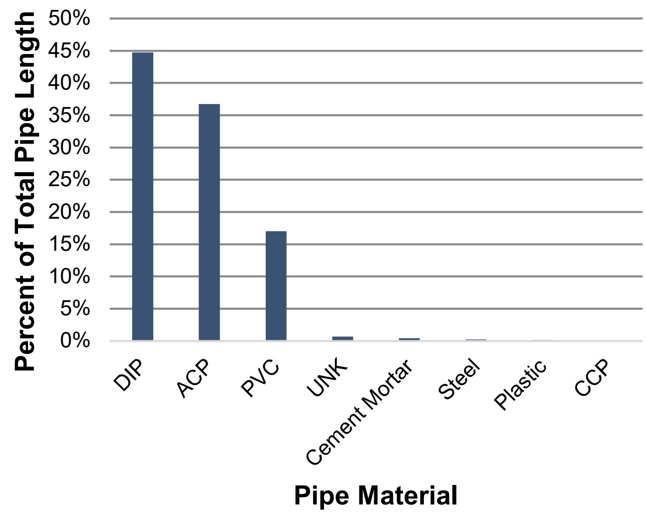


**Figure 5-2: Existing Pipelines by Material**

Pipe ages were taken from their year of installation, and as shown in Table 5-10 and Figure 5-10, the system contains pipe installations as early as the 1940's, with the majority of pipes in the 10-20 year age range. There are also about 91 miles, or about 27 percent of pipes with an unknown age.

**Table 5-10: Existing Pipelines by Material**

| Age (years) | Length (ft) | Length (mi) | Percentage (%) |
|---|---|---|---|
| 0-10 | 11,697 | 2.22 | 0.66% |
| 10-20 | 720,714 | 136.50 | 40.67% |
| 20-30 | 172,471 | 32.67 | 9.73% |
| 30-40 | 82,014 | 15.53 | 4.63% |
| 40-50 | 93,045 | 17.62 | 5.25% |
| 50-60 | 116,463 | 22.06 | 6.57% |
| 60-70 | 89,934 | 17.03 | 5.08% |
| 70-80 | 4,876 | 0.92 | 0.28% |
| UNK | 480,871 | 91.07 | 27.14% |
| TOTAL | 1,772,085 | 335.62 | 100.00% |

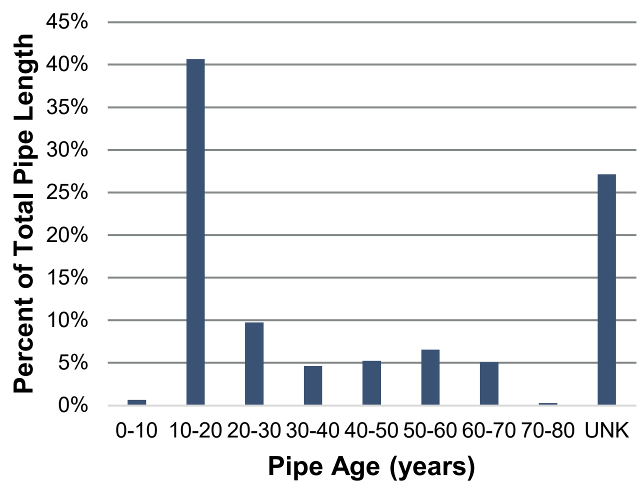


**Figure 5-3: Existing Pipelines by Age**

## 5.7 Emergency Connections

As shown in Table 5-11, IWA has three emergency connections with CVWD in different states of completion, which were constructed as part of an agreement between IWA and CVWD; however, none of the emergency connections are currently activated. It is IWAs intent to fully equip the emergency connections, as described in section 10.5 and Appendix C.

**Table 5-11: Emergency Connections**

| No. | Location | Constructed | Valve Configuration | Estimated Capacity (gpm)[1] | Flow Direction |
|---|---|---|---|---|---|
| 1 | NW Corner of Madison St & Ave 40 | 8/20/2007 | 8-inch Cla-valve and meter; currently valves are off with no current set points on Cla-valve | 3,100 | One way to IWA |
| 2 | NE Corner of Congress St & Philadelphia Ave | 12/1/2003 | One valve with four stub outs; no meter or Cla-valve | 3,800 | One way to IWA |
| 3 | South side of Miles Ave 250' W/O Monticello Ave | 5/21/2004 | 6-inch Cla-valve and meter; currently valves are off with no current set points on Cla-valve | 4,000 | One way to IWA |

[1] From IWA 2015 UWMP.

### 5.7.1 Location 1 – Avenue 40 & Madison Street

This is an existing emergency connection between the northwestern portion of IWA's Main Zone and CVWD's Sun City pressure zone. The emergency connection is located on the northwest corner of the intersection of Madison Street and Avenue 40 in a below grade vault outside of the street. This emergency connection has the ability to flow in one direction from CVWD to IWA since CVWD's Sun City pressure zone is at a higher HGL. The emergency connection is equipped with an 8-inch PRV and flow meter; however, the emergency connection is currently inactive as the valves are closed and there are no set points on the PRV.

### 5.7.2 Location 2 – Congress Street & Philadelphia Avenue

This is an existing emergency connection between the western portion of IWA's Main Zone and CVWD's La Quinta pressure zone. The emergency connection is located on the northeast corner of the intersection of Congress Street and Philadelphia Avenue in a gated community in a below grade vault in the street. This emergency connection has the ability to flow in one direction from CVWD to IWA since CVWD's La Quinta pressure zone is at a higher HGL. The emergency connection piping is 6-inch in diameter; however, there is no meter or control valve installed.

### 5.7.3 Location 3 – Miles Avenue & Monticello Avenue

This is an existing emergency connection between the western portion of IWA's Main Zone and CVWD's La Quinta pressure zone. The emergency connection is located on the south side of Miles

Avenue approximately 250 feet west of Monticello Avenue in a below grade vault outside of the street. This emergency connection has the ability to flow in one direction from CVWD to IWA since CVWD's La Quinta pressure zone is at a higher HGL. The emergency connection is equipped with a 6-inch PRV and flow meter; however, the emergency connection is currently inactive as the valves are closed and there are no set points on the PRV.

### 5.7.4 Potential Turnouts/Emergency Connections

As discussed in the Section 4, IWA is considering a future turnout at the Coachella Canal near the intersection of Dillon Road and Avenue 44 for a future surface water treatment plant.

The Myoma Dunes Mutual Water Company (MDMWC) distribution system is located adjacent to the western area of IWA's Main Zone at Jefferson Street between Indio Boulevard and Fred Waring Drive. This potential emergency connection would likely flow only in one direction from MDMWC to IWA based on HGLs of the pressure zones. However, this would be located in close proximity to two existing emergency connections and therefore would add little hydraulic benefit.

In addition, CWA's water distribution system is located east of IWA's Main Zone and Terra Lago Zone. As part of the CWA and IWA Chromium-6 Treatment and Compliance Study (Hazen, 2015), a total of seven different potential emergency connection locations were identified. These would generally flow one way from IWA to CWA based on zone HGLs although under higher demand scenarios, HGL differentials were relatively low, which would limit the ability to transfer water.

Any new emergency connections should be equipped with appropriate backflow prevention devices where required to prevent bi-directional flow, pressure sustaining features to prevent excessive flows and pressure drops from the delivering agency, and pressure reducing features to prevent over-pressurization of the receiving agency.

# 6. Evaluation Criteria and Design Standards

The following evaluation criteria and design standards were used to establish existing and projected demand conditions, evaluate the performance of the distribution system, identify any existing deficiencies, and plan for future infrastructure needs. These criteria were developed based on previous planning documents including the 2007 and 2012 Water Master Plans, California State codes, data provided by IWA, and AWWA standards.

## 6.1 Demand Factors

Water demand planning factors are used for planning purposes to evaluate the potential effects of proposed developments on IWA's supply delivery and system conveyance. These demand factors correspond to land use type and have been calculated based on the demands and land uses described in Sections 2 and 3. It should be noted that the demand factors listed in Table 6-1 correspond to the SB X7-7 2020 gpcd Target and should be considered conservative.

**Table 6-1: Demand Factors**

| Land Use Designation | Planning Demand Factor (gpd/ac) |
|---|---|
| Single Family Residential | 1,745 |
| Multi-family Residential | 5,817 |
| Commercial/Institutional | 1,128 |
| Industrial | 452 |
| Landscape Irrigation | 1,571 |

## 6.2 Diurnal Curves

Water demands vary throughout the day and season based on customer use. Residential use is typically characterized by a dual-peak diurnal with a primary peak occurring in the early morning hours, and a secondary peak occurring in the evening. Commercial, institutional, and industrial use are typically consistent during work hours with low usage overnight. Irrigation use is typically a consistent flow overnight. As part of the Pump Operational Plan Energy Model and Implementation (IDModeling, September 2011), diurnal curves were developed for summer, spring, fall, and winter based on well pumping SCADA data. As part of this WMP effort, the 2011 diurnal curves were generalized to eliminate the "noise" from the SCADA as shown in Figure 6-1. Also, a composite of spring and fall diurnals was created to represent average day demand conditions as shown in Figure 6-2. The Summer diurnal was applied to the maximum day demand scenario. These diurnal curves are applied to the hydraulic model on a system-wide basis irrespective of land use type or pressure zone. The peaking in spring/fall and in winter is more attenuated due to seasonal population in the winter and irrigation demands during the summer.

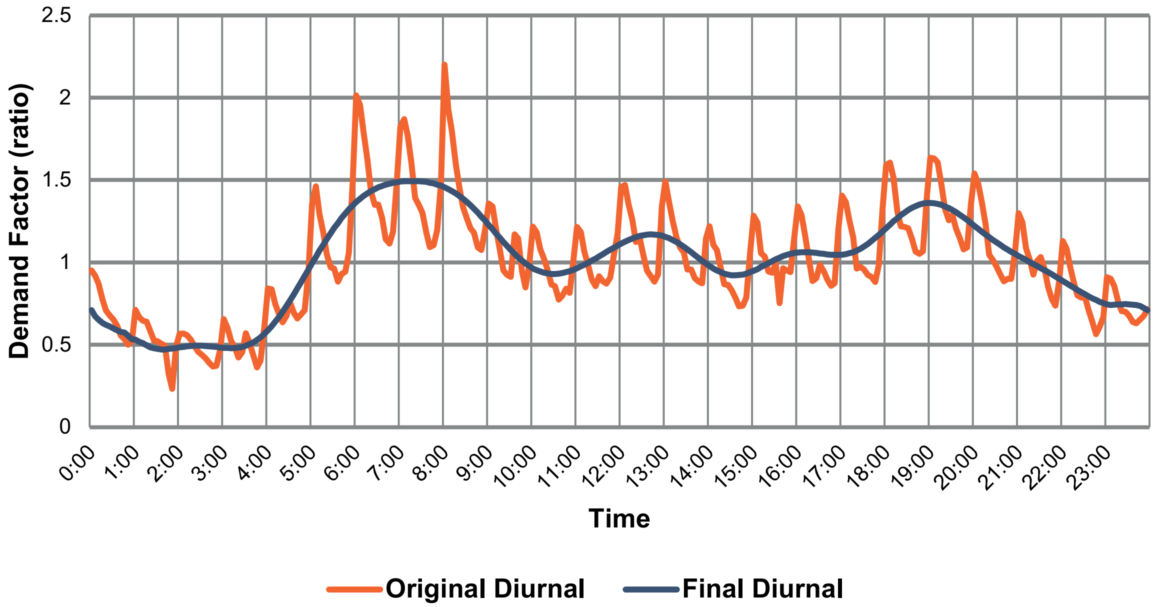


**Figure 6-1: Summer Diurnal Curve Adjustment**

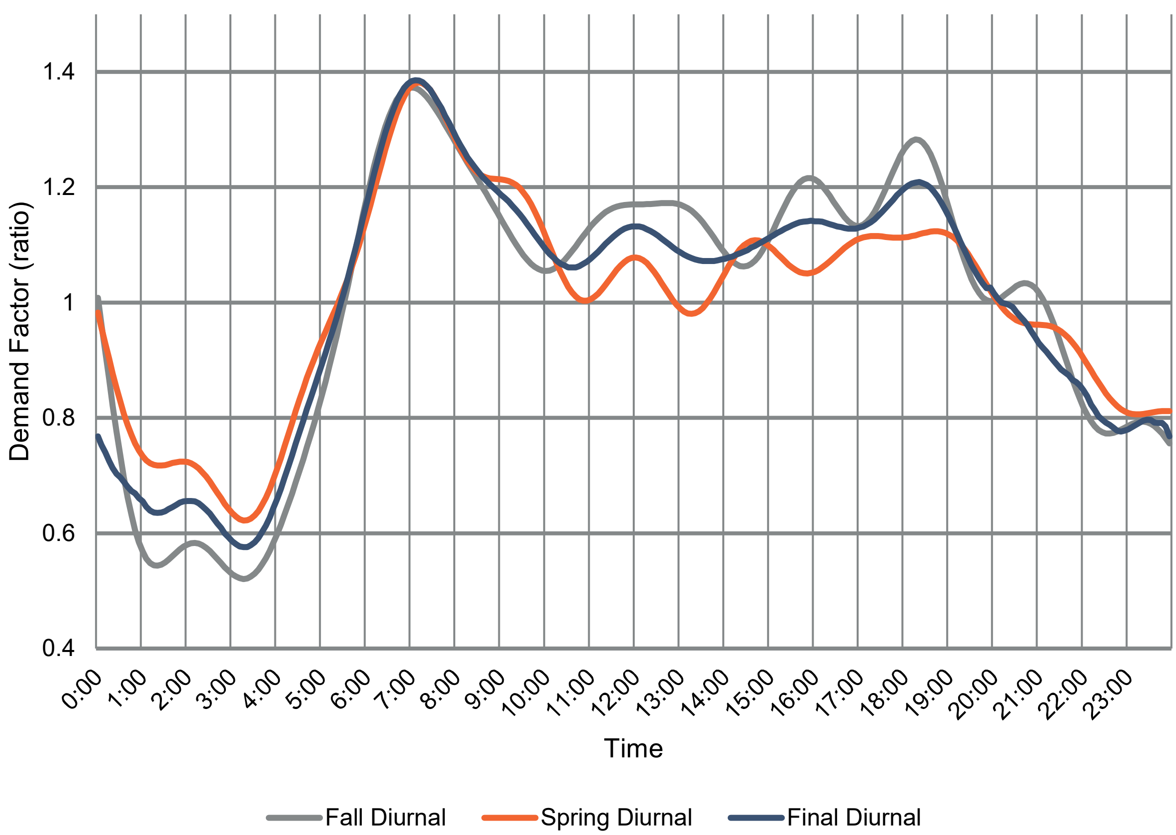


**Figure 6-2: Spring/Fall Composite Monthly Production Diurnal Curve**

## 6.3 Peaking Factors

Water demands also vary throughout the year due to seasonal changes in weather and population. Peaking factors are used to capture the high and low demand conditions for analysis purposes. Maximum day demand represents the day with the highest total demand during the year, which for IWA typically occurs in the summer in July. Minimum day demand represents the day with the lowest total demand during the year, which for IWA typically occurs in the winter in January. The total production monthly for calendar years 2013 to 2017 is presented in Figure 6-3.

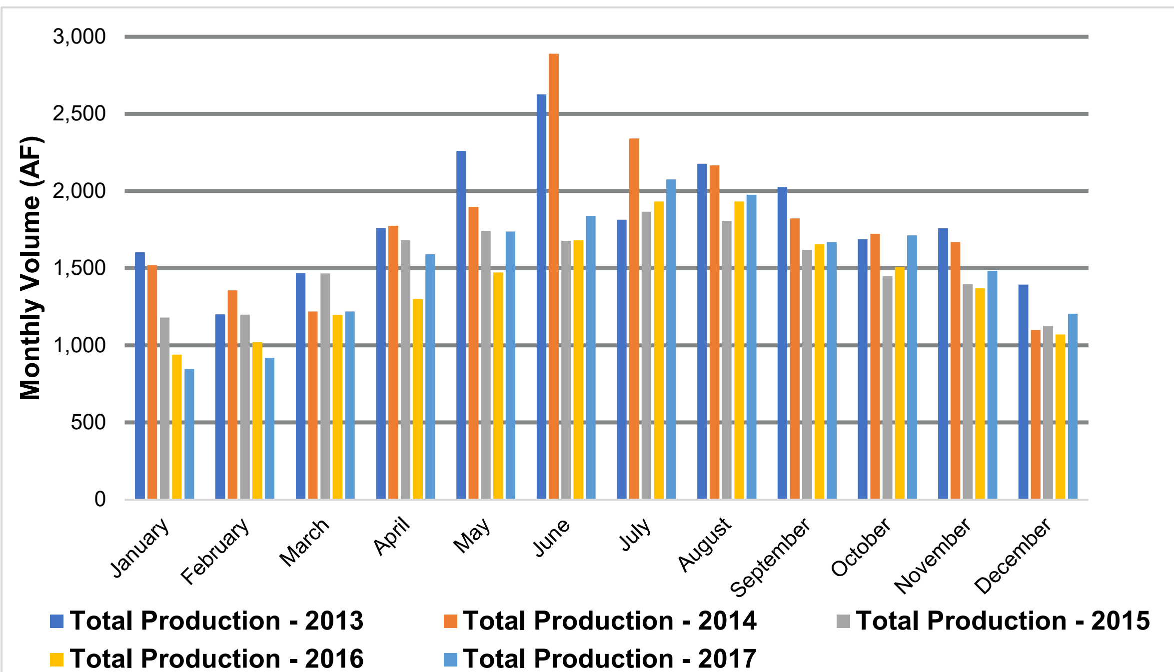


**Figure 6-3: Monthly Production**

As discussed previously, an average of the 2015 and 2016 production data was utilized for the baseline existing demand calculations. Minimum and maximum month factors were calculated based on production data for that period. Minimum day demand was assumed at 80 percent of a minimum month demand and maximum day demand was assumed at 120 percent of a maximum month demand based on general industry standards. The peak hour demand factor was calculated by applying the peak hour factor from the diurnal to the maximum day demand factor. A summary of past peaking factors and values used for this WMP are provided in Table 6-2.

**Table 6-2: Peaking Factors**

| Demand Condition | 2007 WMP Value | 2012 WMP Value | 2018 WMP Value |
|---|---|---|---|
| Minimum Day Demand | - | - | **0.5** |
| Minimum Monthly Demand | - | - | **0.6** |
| Maximum Month Demand | *1.29* | *1.4* | **1.3** |
| Maximum Day Demand | *1.7* | *1.3* | **1.6** |
| Peak Hour Demand | *2.5* | *2.3* | **2.4** |

Note: All peaking factors are applied to Average Day Demand.

## 6.4 Storage Criteria

AWWA M32 Manual – Computer Modeling of Water Distribution Systems provides guidelines on storage criteria to support normal and emergency system operation. The Manual identifies three primary storage components:

- Equalization storage: Amount of water required to meet demands in excess of normal production and delivery capabilities.
- Fire storage: Volume of water based on the maximum fire flow requirement in each pressure zone multiplied by the required flow duration.
- Emergency storage: Amount of storage as determined by each individual agency necessary to provide water during emergency events such as facilities failures or power outages.

IWA storage criteria are summarized in Table 6-3. Refer to Table 6-4 and Table 6-7 for fire flow criteria and storage requirements.

**Table 6-3: Storage Criteria**

| Storage Component | Criteria |
|---|---|
| Equalization | 20% of MDD |
| Fire | Fire Flow x Duration |
| Emergency | 10% of MDD |

**Table 6-4: Fire Storage Requirements**

| | Main Zone | Shadow Lake Zone | Terra Lago Zone |
|---|---|---|---|
| Maximum Fire flow (gpm) | 4,000 | 1,500 | 3,000 |
| Duration (hr) | 4 | 2 | 3 |
| Total Storage (gallons) | 960,000 | 180,000 | 540,000 |

## 6.5 Pressure Criteria

The purpose of pressure criteria is to ensure that certain minimum standards are maintained to protect public health, provide ample pressure at hydrants for fire protection, and provide an adequate level of customer service. Minimum pressures help prevent negative pressures from occurring, which can draw groundwater or other contaminants in though pipe joints. Maximum pressure standards help protect customer plumbing from excessive pressures, reduce water hammer, limit unnecessary use of water and water loss, energy efficiency, and limit water waste from pressure relief valves discharges.

The California Public Utilities Commission (CPUC) General Order 103-A establishes rules governing water service, including minimum standards for operation, maintenance, design, and construction. These rules include the following:

- Pressure not less than 40 psi except during PHD not less than 30 psi
- Pressure not more than 125 psi except during minimum demand not greater than 150 psi
- Variations shall not exceed 50 percent of the average operating pressure

As shown in Table 6-5, the California Plumbing Code also requires that individual pressure regulators be installed where the system pressure is greater than 80 psi.

It should be noted that there are non-service areas of the water system where typical service pressure criteria may not apply such as plant piping upstream of distribution, transmission piping without services through mountainous areas, and transmission piping near high-level ground storage. These areas are evaluated on an individual basis with the minimum goal of avoiding any negative pressures.

**Table 6-5: Pressure Criteria**

| Category | Criteria |
|---|---|
| Minimum Service Pressure During Peak Hour Demand | 40 psi |
| Maximum Service Pressure During Minimum Hour Demand[1] | 120 psi |
| Minimum Fire Flow Pressure | 20 psi |
| Pressure Variation | 50% of the average operating pressure |

[1] Where water pressure exceeds 80 psi, pressure regulators are required per the CPUC.

## 6.6 Pipeline Velocity and Headloss Criteria

Pipeline internal velocity and headloss limitations help improve system life by limiting damage to internal coatings and gaskets, water hammer, and also help improve system efficiency by limiting energy losses. AWWA M32 – Computer Modeling of Water Distribution Systems provides some typical criteria. The Hydraulic Institute along with pipe and valve manufacturers can provide more specific design criteria. The general system velocity and headloss criteria are listed in Table 6-6. More strict head loss criteria is applied to large transmission pipelines, especially where pumping is involved, as higher friction slopes over long distances can result in excessive energy loss and oversized pumping facilities.

**Table 6-6: Pipeline Velocity and Head Loss Criteria**

| Category | Criteria |
|---|---|
| Velocity | |
| Typical Demands (ADD&MDD) | 5-7 ft/s |
| Peak Hour Demand | 8 ft/s |
| Fire Flow | 15 ft/s |
| Head Loss | |
| Pipes 18-inch diameter and greater | 3 ft / 1000 ft |

## 6.7 Fire-Flow Criteria

The fire-flow required is the flow rate of a water supply, measured at 20 psi residual pressure, that is available for firefighting. The purpose of fire-flow criteria is to maintain minimum fire safety requirements for the protection of life safety as well as buildings and other facilities. The criteria listed in Table 6-7 is generalized planning-level criteria utilized for master planning purposes. These criteria were updated from the 2012 WMP, determined acceptable by the Indio Fire Marshall.

Actual fire-flow requirements are subject to the requirements of California Fire Code and Riverside County Fire Department, and are based upon building category, construction type, fire-flow area, presence of hazardous materials, and high fire hazard areas. Reductions in required fire-flow may be allowed by the Riverside County Fire Department where automatic sprinkler systems are provided, but not below the minimum set forth in Ordinance No. 787.

**Table 6-7: Fire-Flow Criteria**

| Land Use Designation | Fire Flow Required (gpm) | Duration (hrs) |
|---|---|---|
| Single Family Residential | 1,500 | 2 |
| Multi-family Residential, Mobile Home | 2,500 | 2 |
| Mixed Use | 3,000 | 3 |
| Commercial, Institutional | 3,000 | 3 |
| Manufacturing | 4,000 | 4 |
| Industrial | 4,000 | 4 |

## 6.8 Pumping Criteria

Sufficient pumping capacity must be available to meet demands and fire-flow requirements on a system-wide level as well as on a pressure zone level via a combination of groundwater well supply and water transfer provided by booster pump stations. As presented in Table 6-8, groundwater well supply was evaluated based on the firm active well capacity (active wells with the capacity of the largest active well excluded).

For open pressure zones (zones supplied by gravity storage), direct firm pumping capacity was evaluated based on maximum day demand plus a replenishment flow for refilling storage after a fire event. For closed zones, or zones without gravity storage, direct firm pumping capacity was evaluated based on peak hour demand plus the maximum fire-flow required.

**Table 6-8: Pumping Capacity Criteria**

| Condition | Capacity Criteria |
| --- | --- |
| Well Supply Capacity | Total active well capacity excluding the largest well must be greater than MDD |
| Direct Firm Pumping Capacity | |
| Open Zone | MDD plus fire flow replenishment[1] |
| Closed Zone | PHD plus fire flow |

[1] Flow necessary to replenish fire flow volume in an 8-hour window.

## 6.9 Recycled Water Distribution

Many water agencies in California are providing recycled water for residential landscaping, industrial processes, and other non-drinking purposes, including the flushing of toilets and urinals. The use of disinfected tertiary recycled water for toilet and urinal flushing in nonresidential buildings is allowed in Section 60307(a) of Title 22 of the California Code of Regulations (Title 22), provided that the recycled water is treated to a minimum disinfected tertiary level. Additionally, disinfected tertiary recycled water for residential landscape irrigation is allowed in Section 60304(a) of Title 22.

Title 22 defines a “dual plumbed system” as a system that utilizes separate piping systems for recycled water and potable water within a facility and where the recycled water is used for either serving plumbing outlets (excluding fire suppression systems) within a building or for serving outdoor landscape irrigation at individual residences. While Title 22 prohibits the delivery of recycled water for any internal use to any individually-owned residential units, this ban was superseded by a change in Section 13553(d) of the California Water Code that allows this use. Title 22 prohibits delivery of recycled water for internal use at any facility that produces or processes food products or beverages except for cafeterias or snack bars, which the classification is reviewed on a case by case basis by the California Department of Public Health (CDPH).

California Legislature has declared that development of recycled water should be encouraged as a new water supply necessary to meet the future water needs of the State and use of potable domestic water for non-potable uses that are approved by the State for recycled water use may constitute waste or a unreasonable use within the meaning of the California Constitution, Article X, Section 2 if recycled water is available at a reasonable cost (Water Code §§ 13510 et seq. and 13550 et seq.). Additionally, the Water Recycling in Landscaping Act, S.B. 2095 enacted in 2000, further encouraged recycling by requiring local agencies, when notified of available recycled water from producers, to adopt an ordinance requiring, in part, that new industrial, commercial and residential projects requiring a tentative map or parcel map and located in the recycled water use area, install separate plumbing systems for non-potable uses. As part of implementing a non-potable, recycled water system, IWA will need to update the development standards to include the requirement for new developments to provide dual piping systems for new water supplies.

# 7. Hydraulic Model Update

The hydraulic model is a computerized representation of the water distribution system. It consists of elements that represent the actual physical facilities of the distribution system including the network of pipelines, wells, pumps, control valves, hydrants, and storage reservoirs. It also includes parameters that represent customer demands and fluctuations as well as control settings. A hydraulic model is a tool that can be used for analysis and planning to predict system performance, identify deficiencies, optimize system performance, and size new facilities. It can also integrate with GIS data for model updates.

The last previous overall model update and calibration was done as part of the Pump Operational Plan Energy Model Implementation (IDModeling, 2011) and Near Term CIP Development (IDModeling, 2011) as part of the 2012 WMP Update. Additional updates focused on the addition of treatment at Wells AA, 13A, and 1E were done as part of the Chromium-6 Treatment and Compliance Study (Hazen, 2015). The hydraulic model update for this master plan update builds upon this prior work as described herein. The existing model was in the Bentley WaterCAD software platform and has been updated to WaterGEMS for this master plan.

IWA's hydraulic model is considered an "all pipes model" as it essentially includes all pipes in the distribution system, including fire hydrant laterals, but excluding service lines.

## 7.1 Facilities Update

Since the last major model update in 2011, many changes in the distribution system have occurred. The facilities update began by comparing the existing hydraulic model pipes and hydrants to IWA's latest GIS database to identify any changes or discrepancies. One issue encountered is that the model element IDs did not correlate to the IDs in the GIS. Additionally, some of the new pipelines that had been added to the hydraulic model in previous updates were drawn in by hand and their alignments did not correspond directly to their alignments in the GIS. In attempt to remedy the lack of element correlation, a spatial join using a buffer was performed to cross-map the majority of the model elements to the GIS elements. As part of this process, many anomalous diameters were identified (e.g., hydrant laterals incorrectly labeled with diameter of "0-inch" or "1-inch") as well as discrepancies in diameters between the GIS and model. Pipe breaks and node connectivity with respect to hydrant assembly convention was also discussed. After a round of updates performed by IWA's GIS consultant, IWA staff assisted in the review and resolution of diameter discrepancies using record drawings where available. Where record drawings were not available, engineering judgement was used based on adjacent piping diameters to update the model.

After the GIS update process was complete, the GIS database was imported into the hydraulic model's base scenario to update existing facilities and add new facilities. Through this process, the element IDs in the GIS were imported into the model "GIS-ID" field. This is a special field that the model uses to link the model with the GIS database for added functionality in model updating, which should help facilitate future updates. For elements without GIS-IDs, the elements in the existing model were retained if present. If not, they were assigned IDs according to the following:

- Pipes: P-00000
- Junctions: J-00000
- Hydrants: HY-00000

Any duplicate or abandoned facilities were subsequently deleted from the model manually. An additional series of reviews were performed using built-in model tools to identify and resolve any of the following issues:

- Nodes in close proximity
- Crossing pipes
- Orphaned nodes
- Pipe split candidates
- Duplicate pipes
- Initially isolated elements

Pipe Hazen-Williams coefficients, also known as the "C" or "roughness" coefficients, were utilized from the existing model. New pipes added to the model were assigned a default value of 130. A summary of the resulting ranges of coefficients by pipe material from the existing model is provided in Table 7-1.

**Table 7-1: Hazen-Williams Coefficients
(Previously Entered into the Model)**

| Material | "C" Coefficient |
|---|---|
| Asbestos Cement | 110 - 130 |
| Cast Iron | 130 |
| Cement Mortar Lined and Coated | 120 - 130 |
| Copper | 130 |
| Ductile Iron | 90 - 130 |
| Polyvinyl Chloride | 110 - 130 |
| Unknown | 110 - 130 |

Node elevations were updated by overlaying a Riverside County contour shapefile with the model nodes and spatially joining for elevation assignment.

Facilities including tanks, pumps, wells, and treatment were manually updated based on the latest information and location. Lastly, any proposed facilities were deactivated under existing condition scenarios.

It was noted that there are three major areas in the GIS where existing pipelines are present, but without any hydrants. These areas are identified as follows:

1. Existing residential development on Avenue 44 approximately 3,500 feet east of Golf Center Parkway.
2. Existing residential development west of Polo Estates Boulevard between Blackstar Drive and Avenue 52.
3. Proposed development on the northwest corner of Monroe Street and Avenue 49.

Hydrants should be added to the GIS and hydraulic model after the next GIS update.

## 7.2 Scenario Update

The existing model scenarios consisted of a steady state average day demand scenario, and a series of extended period simulation (EPS) scenarios according to season, including winter, spring, and summer. A steady state simulation is a single snapshot in time and does not include any variations in changes in the model over time. Steady state simulations are typically used for evaluating general system pressures, fire flows and pipe velocities. On the other hand, extended period simulations are performed over a finite period of time and incorporate system controls and changes in the system over time, such as a tank emptying and a pump activating based on level control. Extended period simulations are often useful in evaluating tank level fluctuations, controls, and water age.

The scenarios from the existing model were consolidated into average day and maximum day demand scenarios. Steady state scenarios were also added for these demand conditions including peak hour demand during a maximum day and fire flow.

Future demand scenarios under maximum day demand were added and associated system improvement in 5-year increments up to year 2038. Refer to Section 8 for more detailed information.

## 7.3 Demand Allocation

The consumption of water is the driving force behind the hydraulic dynamics occurring in water distribution systems. When simulating these dynamics in the water distribution model, an accurate representation of system demands is as critical as precisely modeling the physical components of the model.

For the 2007 WMP, demands were input for the 50 largest water users, all remaining demands were evenly distributed throughout the system, and demands were scaled such that water consumption values were scaled up to equal the production values. In 2012, a detailed estimation was done for demand projections for three tiers ranging from aggressive, to moderate, to conservative. This was due to the uncertainty in development trends due to the housing crisis and recession.

As part of the facility update from GIS discussed previously, demand nodes were removed and modified by the software's model building tool resulting in a decrease of the original total demand by approximately 5.8 percent with the distribution of demand remaining relatively consistent. Zonal distribution of demands was estimated by assigning parcels from the City land use shapefile to each pressure zone and multiplying the area by the water demand factors with some manual adjustments in the

Shadow Lake and Terra Lago areas to exclude lake and golf course areas. In Terra Lago, original demands existing for the WorldMark hotel and clubhouse areas, but not the residential developments to the east, so demands for the residential areas were estimated based on the area and water demand factors and manually evenly distributed.

Refer to Section 3 for more detailed information on demands.

## 7.4 Fire Flow Allocation

Fire flows required at hydrants were updated by creating a 250-foot radius at each hydrant point and assigning the worst-case land use from the City's land use shapefile (in terms of fire flow required) to the hydrant. A preliminary fire flow analysis was run using the model, which analyzes the fire flow required under the specified demand condition node by node, and any deficient nodes with residual pressures less than 20 psi were identified. Deficient nodes were then corrected as appropriate where fire flow requirements were mis-assigned based on land use proximity.

## 7.5 Calibration

The existing model was updated as recently as 2015. For this Master Plan effort, a desktop-level check of system operation was performed based on selected SCADA data provided by IWA and supplemental information provided during discussions with IWA staff. Minor updates to booster pump and well pump controls were performed in order for the model to successfully run under extended period simulations. The model software's validation tool was also used to ensure that model settings and controls were functioning properly.

# 8. System Evaluation

A combination of methods including hydraulic model analyses and tabular calculations were used to analyze IWA's distribution system. For the hydraulic modeling, scenarios were developed to encompass the spectrum of operational conditions that would likely occur over the 20-year planning period. The scenarios analyzed are shown in Table 8-1.

**Table 8-1: Hydraulic Model Scenarios**

| No. | Scenario | Type | Demand Condition | Duration | Year |
|---|---|---|---|---|---|
| 1.0 | ADD_SS | Steady State | Average Day Demand | - | Existing |
| 1.1 | ADD_EPS | Extended Period Simulation | Average Day Demand | 24 hrs | Existing |
| 1.11 | ADD_7DAY | Extended Period Simulation | Average Day Demand | 7 days | Existing |
| 2.0 | MDD_SS | Steady State | Maximum Day Demand | - | Existing |
| 2.1 | MDD_EPS | Extended Period Simulation | Maximum Day Demand | 24 hrs | Existing |
| 3.0 | PHD_SS | Steady State | Peak Hour Demand | - | Existing |
| 3.1 | PHD_SS_FF | Steady State | Peak Hour Demand plus Fire Flow | - | Existing |
| 3.2 | PHD_SS_2023 | Steady State | Peak Hour Demand | - | 2023 |
| 3.2.1 | PHD_SS_2028 | Steady State | Peak Hour Demand | - | 2028 |
| 3.2.1.1 | PHD_SS_2033 | Steady State | Peak Hour Demand | - | 2033 |
| 3.2.1.1.1 | PHD_SS_2038 | Steady State | Peak Hour Demand | - | 2038 |

Critical demand conditions include maximum day demand and peak hour demand. For baseline conditions, steady state and extended period simulations were developed while future scenarios were developed for steady state conditions only. It is noted that fire flow and all future planning periods were conservatively simulated under peak hour demand since the Main Zone is currently considered a closed zone.

## 8.1 Pressure Analysis

The pressure analysis evaluated the pressures of service nodes per the criteria in Section 4. Service nodes are defined as those nodes where customer service occurs, and excludes areas such as inside plant facilities and transmission mains to storage reservoirs. Areas of low and high pressure were evaluated.

### 8.1.1 Low Pressure Areas

Low pressure areas were identified generally on the west to northwestern edge of the Main Zone. Pressures are only moderately deficient based on the IWA minimum pressure criteria of 40 psi, although generally still above the state minimum of 30 psi with the exception of two locations: 42$^{nd}$ Avenue and Country Club Drive and Highway 111 and Jefferson Street. Refer to Exhibit 8-1 for exact locations. Low pressures in these areas are not primarily attributed to head loss as the areas are fed by substantial 18-inch transmission mains, but the low pressures are due to the high elevations, and therefore low static pressures. Potential solutions to remedy low pressure issues due to high elevations include individual customer booster pumps, the creation of a new pressure zone with higher HGL, or raising the HGL of the existing zone. Because the Main Zone essentially operates as a closed zone and the HGL is governed by pump operation, the HGL may only be raised in its current state by either calling on more supply into the zone, or by replacing existing pumps with higher head pumps. Alternatively, the Main Zone could be converted to operate as an open zone by constructing a new Main Zone reservoir at an elevation suitable to provide the minimum required pressure to the low pressure areas. It is recommended that IWA investigate acquiring property in the Indio Hills and perform a reservoir siting study to identify a suitable location for the construction of a new Main Zone tank.

### 8.1.2 High Pressure Areas

Although the majority of the eastern and southern areas of the Main Zone operate in excess of 80 psi as shown in Exhibit 8-2, which require individual pressure regulators, pressures generally do not exceed 100 psi and are not considered an issue.

Pressures in the Terra Lago Zone are particularly high, averaging around 120 psi. As the Terra Lago Zone pressures are primarily set by the water elevation in the Lost Horse Tank, it can be stated that the Lost Horse Tank was constructed at an elevation higher than necessary for the majority of the Terra Lago Zone. According to IWA staff, the Lost Horse Tank elevation was set by the pressure needed at the WorldMark resort, which includes a four-story hotel.

Although ideally the Lost Horse Tank would have been constructed at a lower elevation to avoid unnecessary pumping energy, limited options remain for the Terra Lago Zone including the following:

- Lowering the operational water level of the Lost Horse Tank (which would reduce usable storage);
- Adding energy recovery facilities for the non-resort portion of the Terra Lago Zone, which could be used to provide power to the Terra Lago BPS site. This option would depend on the electricity rate and payback period.

### 8.1.3 Pressure Zone Division

The Main Zone is a large pressure zone that is essentially operated as a closed zone. Closed zones are typically more energy intensive and require proper operation of VFD driven pumps to satisfy pressures and demands. IWA began evaluating the possibility of dividing the Main Zone into smaller zones in the 2007 WMP. The intent was to increase the manageability of operating the zone and also help improve the lower pressures in the west and the higher pressures in the east.

Potential options were evaluated in detail in the 2007 WMP and again in the 2010 Demand Update and Operational Zone Analysis (IDModeling, 2010), 2011 Near Term CIP Development (IDModeling, 2011), and 2012 WMP. A final alternative for pressure zone division was developed that allowed for the sustaining of adequate service pressures during phasing.

However, the pressure zone division did not go beyond the planning level and several items still remained unaddressed including the following:

- Requirement for new booster pumps and well pumps
- Energy impacts
- Impacts due to the creation of dead-ends
- Impact to fire flow availability
- Water age was shown to increase marginally (significant increase in age observed with IWA "strategic valving" in place)
- Supply transfer capabilities and impacts from future water quality regulations

It is recommended to re-evaluate any potential pressure zone division during the preliminary design of the new Main Zone gravity storage reservoir.

## 8.2 Velocity Analysis

A velocity analysis was performed to identify areas of high velocity and/or head loss, as excessive amounts lead to high energy intensity (kilowatt-hour per million gallon of water produced), can damage pipe linings and valve seals, and exacerbate hydraulic transients for example during a sudden pump shutdown due to a power outage or the sudden closing of a control valve.

IWA's distribution system has a strong network of 18-inch and 24-inch backbone piping. No pipeline deficiencies were identified under existing conditions within the distribution system other than a minor deficiencies as shown in Exhibit 8-3. For the Terra Lago PRV location where energy loss is not a primary concern, no recommendations are made. The remaining deficiencies identified are at plant locations where it is typical to have short runs of pipe with higher velocities; therefore, no recommendations are made.

## 8.3 Fire Flow Analysis

A fire flow analysis was performed on all hydrants using the fire-flow required according to the land use as described in Section 7. The Main Zone and Shadow Lake Zone are considered closed zones, therefore the fire flow analysis was performed during peak hour demand as there is not floating reservoir and firm pump capacity must be able to meet fire flow at all times. The required fire-flow is modeled at each hydrant individually and deficiencies are identified for any hydrant with a residual pressure less than 20 psi.

Of the 3,445 hydrants, 301 hydrants (approximately 9 percent of the total) were identified as deficient. Many of these deficiencies are located in residential areas; however, there is a large area of deficiency located at the eastern end of the Main Zone along the industrial corridor along Highway 111. To improve fire flow to this area, a targeted pipeline upsizing and looping project is recommended.

Furthermore, 43 hydrants (approximately 1 percent of the total) were unable to meet the minimum fire-flow requirement of 1,500 gpm. The majority of these deficiencies are located in residential cul-de-sacs. To improve fire flow to this area, a programmatic approach is recommended to periodically upsize fire hydrant laterals and adjacent piping as new developments are constructed or other improvements are made such as street or sewer improvements.

See Exhibit 8-4.

## 8.4 Well Supply Analysis

A tabular well supply analysis was performed comparing the total active firm well capacity (regardless if direct pumping or pumping into a forebay) to existing demand conditions to determine if adequate supply is available. Active firm well capacity includes only those active wells, and excludes the largest single well pump. As shown in Table 8-2, because the Main Zone and Shadow Lake Zone are closed, peak hour demand is used, while since Terra Lago is an open zone, maximum day demand is used.

**Table 8-2: Well Supply Analysis**

| | | | |
|---|---|---|---|
| **Total Pumping Capacity Available (MGD)** | 67.752 | | |
| **Active Firm Well Capacity Available (MGD)** | 53.856 | | |
| **Zone** | Main | Shadow Lake | Terra Lago |
| **Criteria** | PHD | PHD | MDD |
| **Well Pump Capacity Required (MGD)** | 46.220 | 0.159 | 1.257 |
| **Total Well Pump Capacity Required (MGD)** | 47.637 | | |
| **Available Capacity Criterion Met?** | Yes, surplus of 20.115 MGD | | |
| **Firm Capacity Criterion Met?** | Yes, surplus of 6.219 MGD | | |

The results indicate that wells alone are unable to directly serve the full peak hour demands, thereby confirming that plant forebay storage with booster pumping is necessary to serve peak hour demands.

## 8.5 Pump-through Capacity Analysis

An important operational consideration of the plant-type operation where a booster station pumps-through a well grouping's supply capacity is ensuring that there is adequate firm booster station capacity to deliver well supply into the distribution system. A comparison of total well capacity and booster station total and firm capacity is presented in Table 8-3.

**Table 8-3: Well vs. Booster Pump Capacity Analysis**

| Facility/ System | Name | Capacity (gpm) | Total Capacity (gpm) | Booster Pump Capacity (gpm) | Booster Pump Firm Capacity (gpm) | Booster Available Capacity Rate Difference (gpm) | Booster Firm Capacity Rate Difference (gpm) |
|---|---|---|---|---|---|---|---|
| Plant 1 | WELL 1B | 1,900 | 6,250 | 6,150 | 4,100 | -100 | -2,150 |
| | WELL 1C | 1,150 | | | | | |
| | WELL 1E | 3,200 | | | | | |
| Plant 2 | WELL 2C | 1,150 | 3,500 | 4,250 | 1,900 | 750 | -1,600 |
| | WELL 2D | 2,350 | | | | | |
| Plant 3 | WELL 3A | 1,400 | 4,450 | 9,600 | 6,350 | 5,150 | 1,900 |
| | WELL 3B | 1,450 | | | | | |
| | WELL 3C | 1,600 | | | | | |
| Plant 4 | WELL 4A | 2,500 | 6,950 | 6,750 | 4,750 | -200 | -2,200 |
| | WELL 4B | 2,000 | | | | | |
| | WELL 4C | 2,450 | | | | | |

The pump-through analysis indicates that Plant 3's firm booster station capacity is more than adequate. Plant 1 and 2 have adequate total pump capacity; however, are moderately deficient when considering firm pumping capacity. Plant 4's booster station capacity is deficient even when considering total capacity, and is even further deficient when considering firm pumping capacity. It is recommended to increase Plant 4's booster station pumping capacity in the near term, and consider the upgrade of Plant 1 and 2 in the future depending on supply needs.

## 8.6 System Pumping Capacity Analysis

An overall system pumping capacity analysis was performed considering the combination of direct well pumping capacity and plant booster pump station capacity. This analysis considers the demand conditions as listed in Section 6 as well as the fire flow delivery requirement as shown in Table 8-4. Because Terra Lago is an open zone the fire flow requirement is treated as a required replenishment of the maximum fire flow volume required over a replenishment period of 8 hours.

**Table 8-4: System Pumping Capacity Analysis**

| | Main | Shadow Lake | Terra Lago |
|---|---|---|---|
| Booster Firm Capacity Available (gpm) | 17,100 | 1,450 | 3,100 |
| Active Firm Direct Well Capacity Available (gpm) | 21,050 | 0 | 0 |
| Total Pumping Capacity Available (gpm) | 38,150 | 1,450 | 3,100 |
| Criteria | Peak Hour Demand + Fire Flow | Peak Hour Demand + Fire Flow | Max Day Demand + Fire Flow Replenishment |
| Booster Capacity Required (gpm) | 36,098 | 1,610 | 892 |
| Criterion Met? | Yes, surplus of 2,052 gpm | No, under by 160 gpm | Yes, surplus of 2,208 gpm |

The results indicate that  the Main Zone and Terra Lago Zone have a surplus pumping capacity while Shadow Lake is slightly deficient. It is recommended that IWA closely monitor the Shadow Lake pump station and consider doing a follow-up study to optimize its performance.

## 8.7 Storage Analysis

Approximately 75 percent of IWA's storage is in the form of ground level storage with booster pumping, i.e., storage tanks that are located at ground level within the pressure zone service area that require pumping to achieve the HGL of the distribution system. The remaining 25 percent is high-level ground storage provided by the Lost Horse Tank that is able to "float" the Terra Lago Zone by gravity. While the PRV is able to transfer flow from the Terra Lago Zone to the Main Zone, it was disregarded in the storage capacity calculations, due to the time-restricted operation and circular pumping interaction between the Terra Lago BPS and PRV. A summary of the storage capacity analysis is presented in Table 8-5.

**Table 8-5: Storage Capacity Analysis**

| Storage Component | Criteria | Main | Shadow Lake | Terra Lago |
|---|---|---|---|---|
| Equalization (MG) | 20% of MDD | 6.163 | 0.021 | 0.251 |
| Emergency (MG) | 10% of MDD | 3.081 | 0.011 | 0.126 |
| Fire Flow (MG) | Refer to Table 6-4 | 0.960 | 0.180 | 0.540 |
| Storage Required (MG) | | 10.204 | 0.212 | 0.917 |
| Storage Available (MG) | | 13.500 | 0.215 | 5.000 |
| Criterion Met? | | Yes, surplus of 3.296 MG | Yes, surplus of 0.003 MG | Yes, surplus of 4.083 MG |

The storage capacity analysis indicates that there is a significant surplus of storage in the Main and Terra Lago Zones, while the storage is adequate in the Shadow Lake Zone. Storage in the Main Zone is dependent on the operation of wells to fill their respective forebays. The storage is also vulnerable to power outages and it is recommended that booster pumps stations be equipped with back-up generators in order to be relied upon during emergency events.

## 8.8 Water Age Analysis

The hydraulic model was used to perform a 7-day water age simulation under average day demand conditions to identify areas of IWA's distribution system which tend to have higher ages, which can be a surrogate of general water quality. IWA has a history of hot water complaints in the northwest and southeast corners of the distribution system.

The water age analysis indicated high levels of water age in the Terra Lago Zone, the northeast area of the Main Zone fed by the Terra Lago PRV, and the northwest corner of the Main Zone. The water age issue in the Terra Lago Zone can be attributed to the distance that supply must travel to reach the zone, and also the time that water spends in the large 5 MG Lost Horse Tank. The water age in the northwest corner of the Main Zone is primarily attributed to lack of demand and distance for supply to travel.

IWA is currently managing the Terra Lago water age issue by running the Terra Lago PRV to help turn over the Lost Horse Tank. IWA should also consider lowering the operational level in the Lost Horse Tank during low demand periods so long as service pressures and fire flows can still be met. In the northwest, water age can be slightly improved be prioritizing the operation of the nearby Well 13A. Periodic end of line flushing can also be considered. See Exhibit 8-5.

## 8.9 Controls Analysis

A simple, well-engineered system operation protocol results in simplified programming, system operation, energy efficiency, maintaining pressures, and response in emergency situations. Based on a review of the IWA system controls, the following control optimization is recommended:

Conversion of Main Zone from closed zone to open zone will greatly simplify the operation of the Main Zone, reduce pumping requirements from PHD to MDD, limit or eliminate the need for VFD pumps, and stabilize system pressures. For pumps located remote to a new Main Zone Tank, VFD control may help support local system pressures. IWA should track its electrical costs for pumping. Eventually a gravity feed system will become cost effective and more sustainable as electrical rates increase.

## 8.10 Pipeline Looping Analysis

In general, IWA's distribution system has a strong backbone of 18-inch and 24-inch piping. There are locations where pipeline looping would help reduce head loss, improve system pressures, and increase fire flow availability. These locations have been identified and are the following:

- Madison Street between Avenue 42 and Avenue 40 to increase supply transfer capabilities
- Indio Springs Drive loop back to Avenue 44 to increase fire flow availability
- Jefferson Street between Avenue 46 and Highway 111 to improve system pressures
- Avenue 48 between Highway 111 and Van Buren Street to increase fire flow availability

- Avenue 44 between Terra Lago Parkway and Lago Vista for an additional PRV connection from the Terra Lago Zone to the Main Zone
- Ave 50 between Hjorth, Madison, and Jefferson Streets.

It is noted that many of these alignments have challenging crosses including storm water channels, freeways/highways, canals, and limited property available, which should be evaluated during final design.

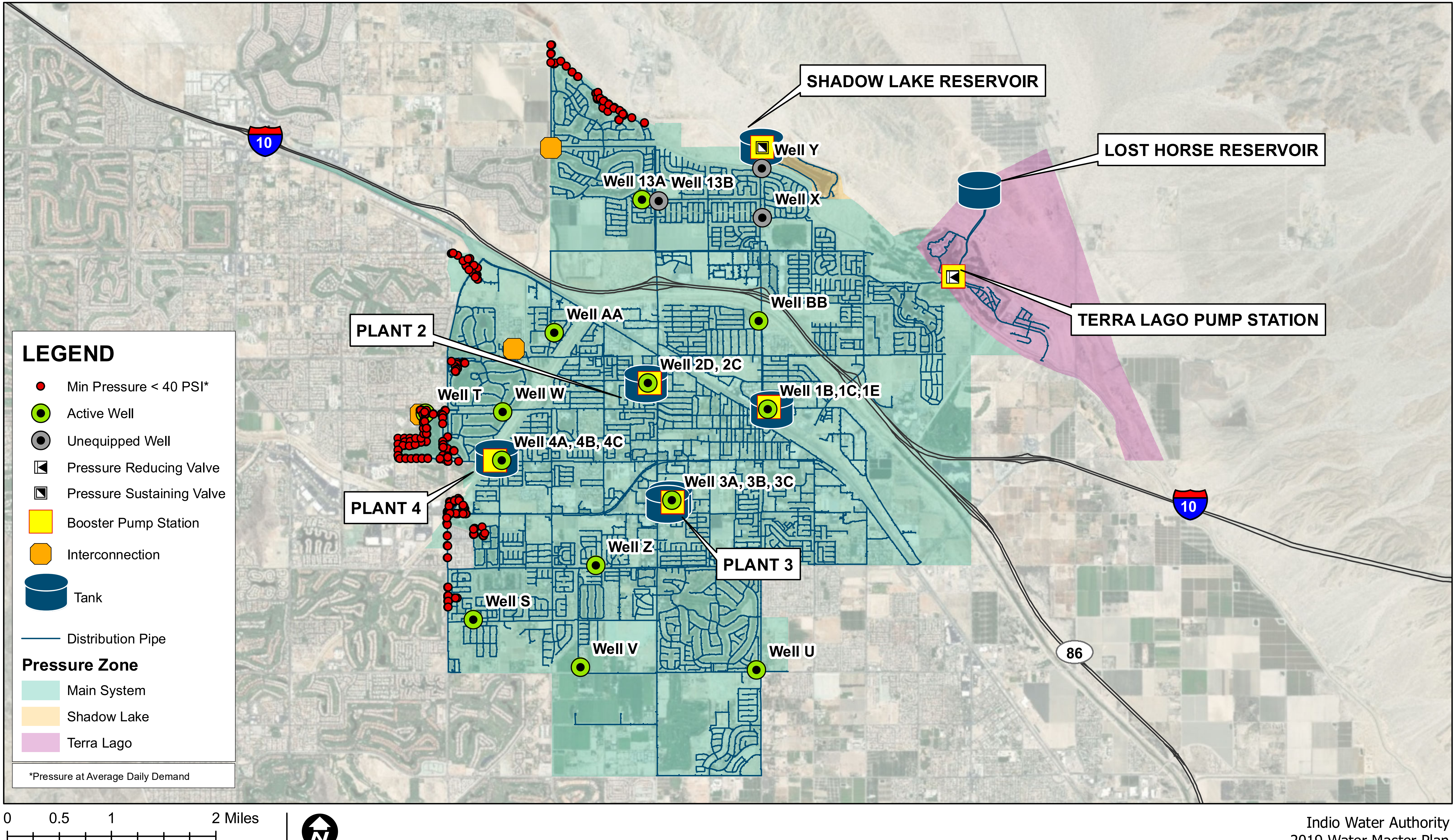


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Exhibit 8-1
Low Pressure Locations

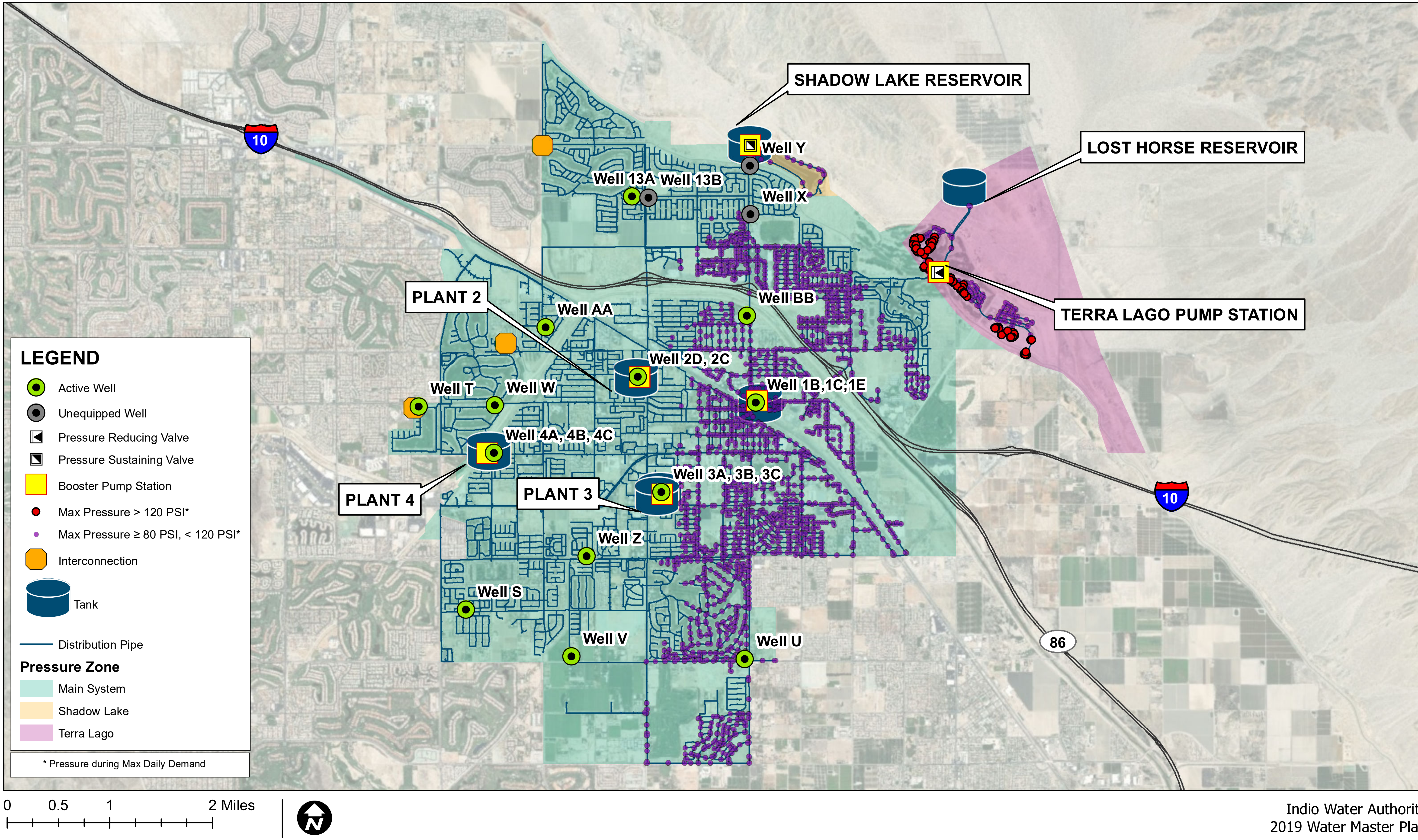


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Exhibit 8-2
High Pressure Locations

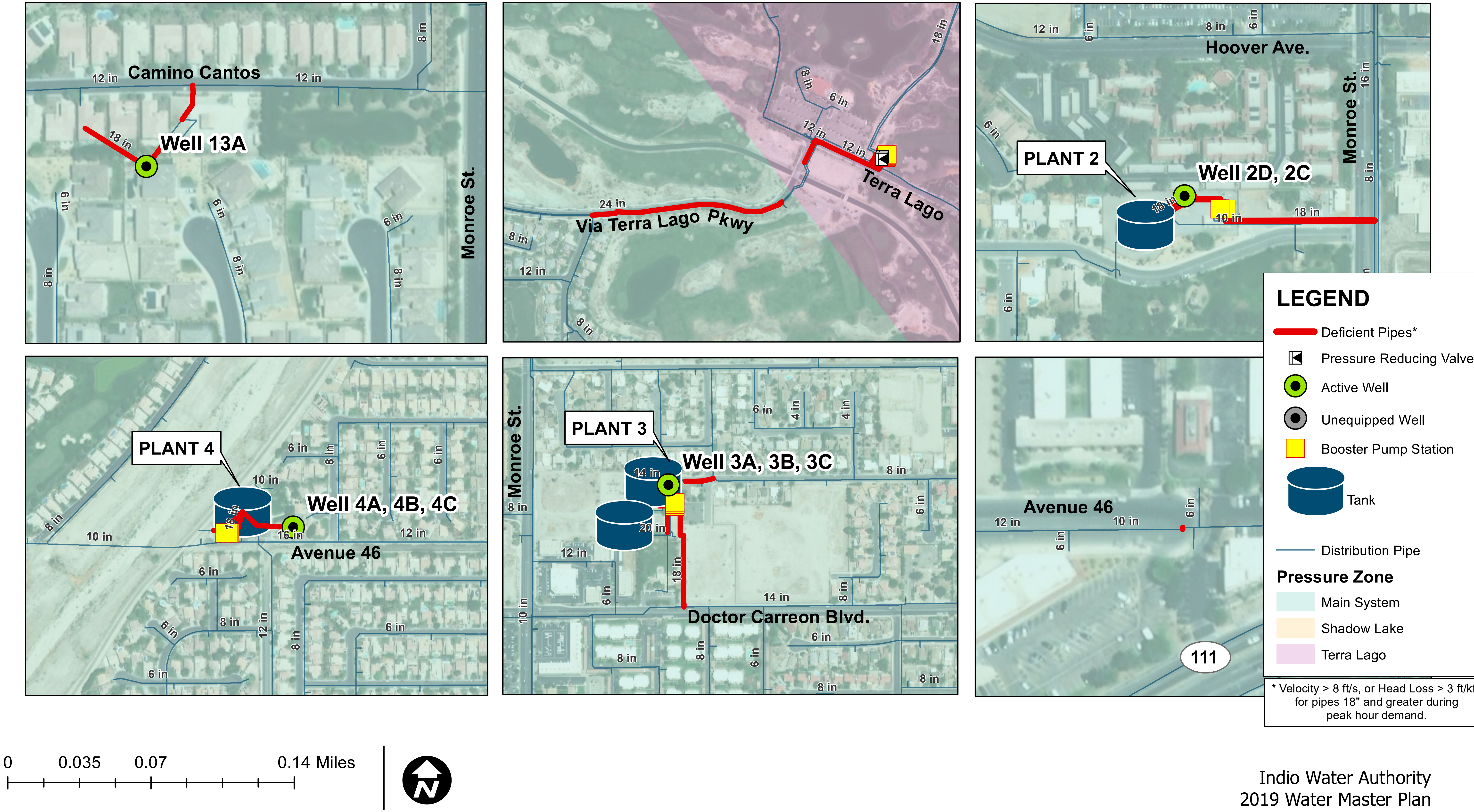


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Exhibit 8-3
Pipeline Deficiencies

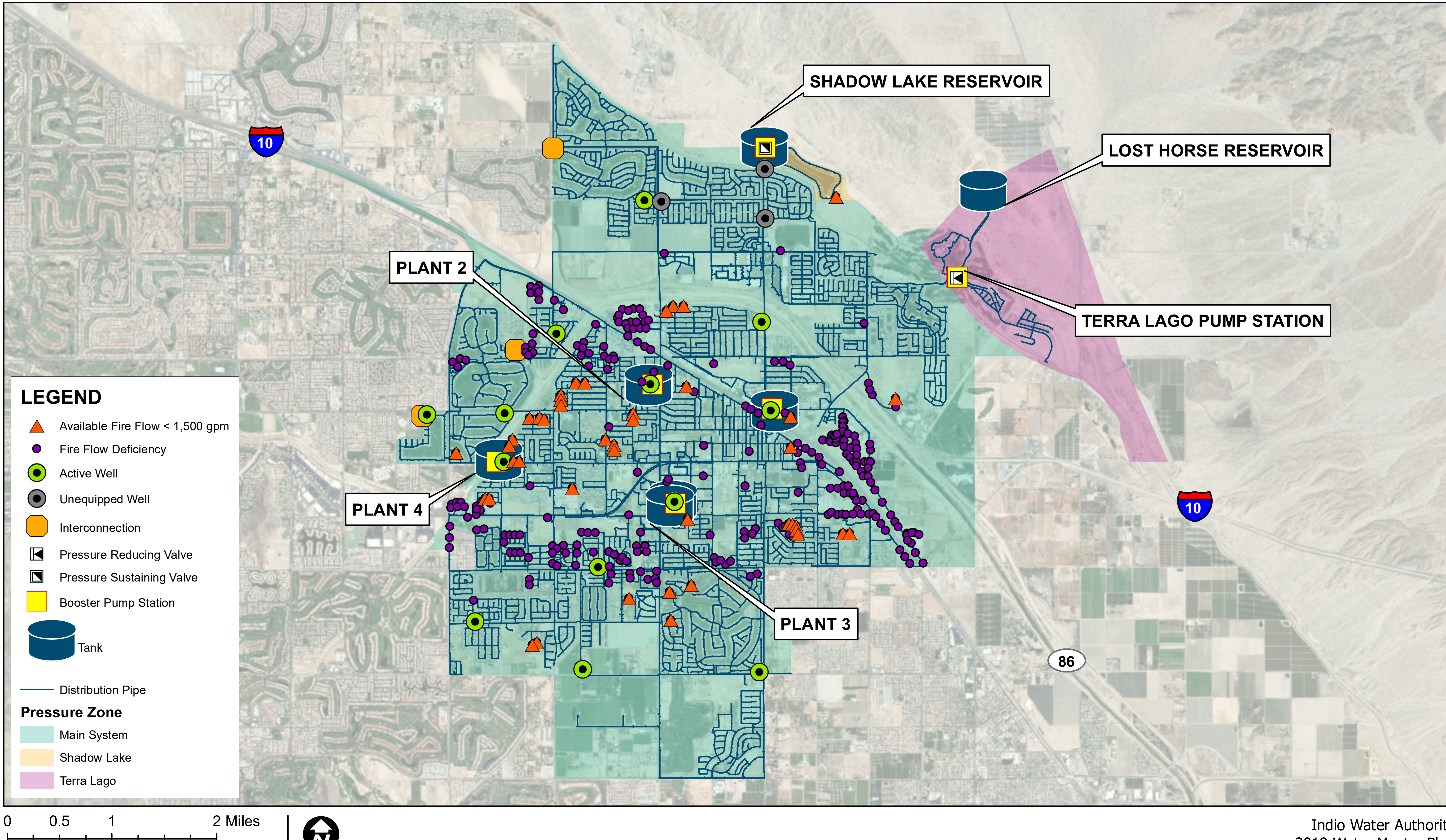


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Exhibit 8-4
Fire Flow Deficiencies

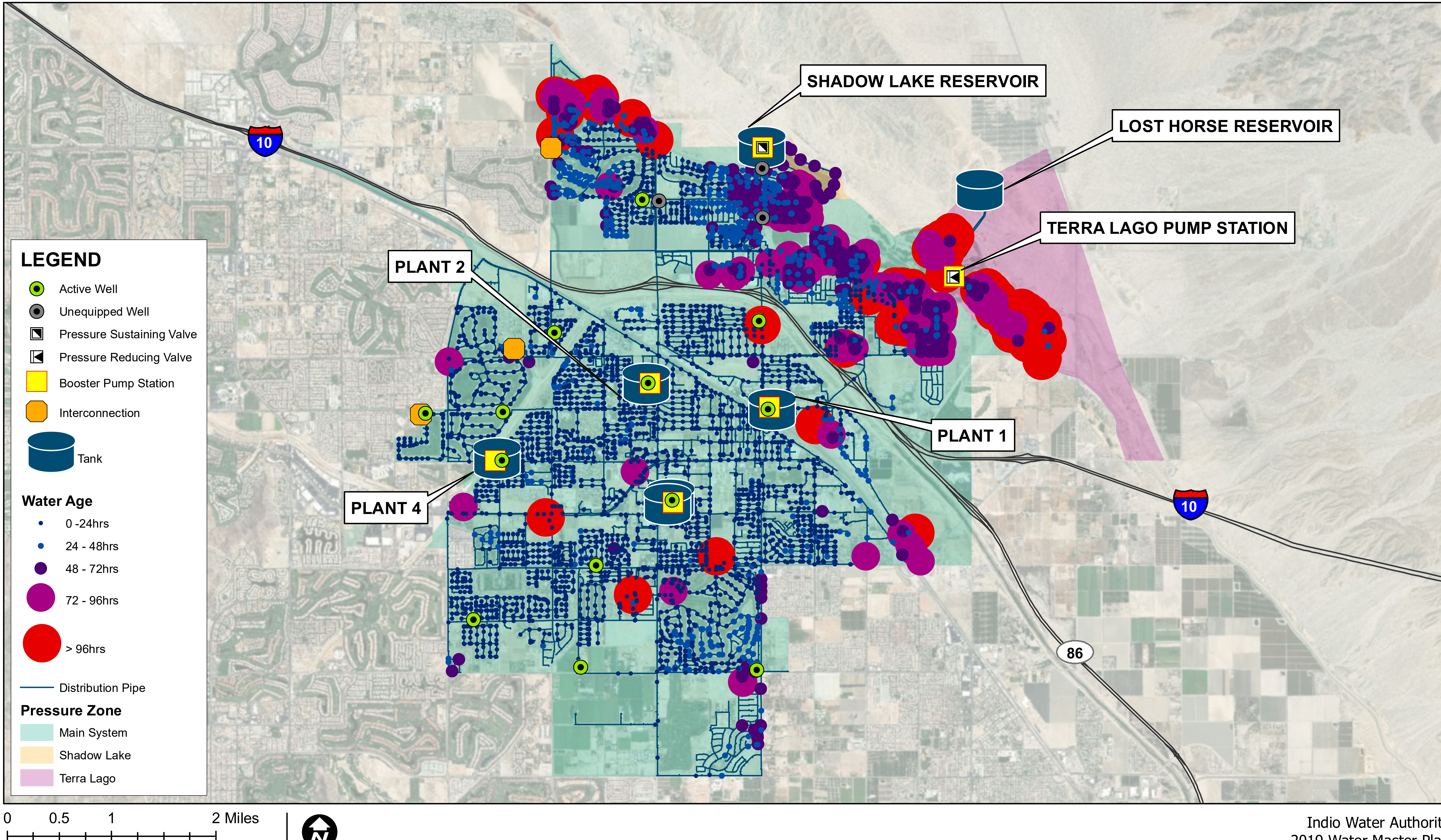


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Exhibit 8-5
Water Age

# 9. Operating Programs

This section presents a review of IWA's existing operating programs developed to enhance system operations and support future growth of the service area. Additionally, this section considers additional operational programs that improve the level of service, operability, water quality, and efficiency of operations.

EPA recommends operating programs and identified the following benefits for maintaining operating programs.

- Prolonging asset life and improving decisions about asset rehabilitation, repair, and replacement
- Meeting consumer demands with a focus on system sustainability
- Setting rates based on sound operational planning
- Budgeting focused on critical activities for sustained performance
- Meeting service expectations and regulatory requirements
- Improving responses to emergencies
- Improving the security and safety of assets
- Reducing overall costs for both operations and capital expenditures

## 9.1 Existing Operating Programs

Currently IWA has robust systems for operating and maintaining the system. The Operations group is responsible for the operations and maintenance of the system. IWA uses a SCADA system to monitor and control the system so that operators can manage the system to ensure that adequate pressure and flows are maintained. Additionally, IWA has implemented an asset management system for all of its horizontal assets with the use of Cityworks.

### 9.1.1 Valve Exercising Program

IWA staff perform valve exercising monthly, data is collected and reported. Data is collected and entered into the asset management system for reporting. Below in Table 9-1 are the associated exercised valves over the past 5 years and percentage based on a total number of valves of approximately 10,000.

**Table 9-1: Valve Exercising**

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Valves Exercised | 1,213 | 1,423 | 1,578 | 1,033 | 908 |
| Percent of Total Valves | 12% | 14% | 16% | 10% | 9% |

### 9.1.2 Valve Replacement Program

IWA staff perform valve replacements based on the valve exercising program and upcoming capital projects where system shut-offs are needed. Table 9-2 has the total number of valves replaced over the past five years and percentage based on a total number of valves of approximately 10,000. Replacement of valves ensures that system can be maintained without impacting additional customers.

**Table 9-2: Valve Replacements**

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Valves Replaced | 3 | 0 | 2 | 4 | 13 |
| Percent of Total Valves | 0.03% | 0% | 0.02% | 0.04% | 0.13% |

### 9.1.3 Meter Replacement Program

IWA currently is nearly the end of their meter replacement program and has switch from remote read to automated reading through a radio read system. IWA should consider implementing real-time demand data into the hydraulic model to provide an accurate representation of the system response to demands, diurnal cycle, which eventually lead to improve operational efficiency and reduced electrical costs. Below in Table 9-3, are the total number of meters replaced over the past five years and percentage based on a total meter count of approximately 21,000.

**Table 9-3: Meter Replacements**

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Meters Replaced | 2,009 | 4,693 | 2,244 | 3,490 | 2,941 |
| Percent of Total Meters | 10% | 22% | 11% | 17% | 14% |

### 9.1.4 Water Service Line Replacement

IWA has a proactive water service line replacement program to replace failing polyethylene service lines. Currently, IWA staff have replaced 85 percent of these services lines with copper services. Below is the total number of service lines replaced over the past five years as shown in Table 9-4 and percentage based on a total service count of approximately 25,000.

**Table 9-4: Water Service Line Replacements**

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Water Service Lines Replaced | 123 | 131 | 138 | 137 | 177 |
| Percent of Total Services | 0.5% | 0.5% | 0.5% | 0.5% | 0.7% |

### 9.1.5 Pressure Zone Reconfiguration

Hazen has reviewed the hydraulic model and a pressure zone reconfiguration is currently not necessary; however, as the system expands to the undeveloped portions to the northeast part of Indio, pressure zones will be needed for supply. Moreover, the Main Zone has, in both practice and model simulation, exhibited conditions where booster pumps conflict in their contribution to the HGL. This can lead to unnecessary losses in energy, and stresses on the pumps can reduce their useful life. Hazen has demonstrated in the hydraulic model the mitigating properties a floating reservoir can bring to the Main Zone via pressure supply and stabilization. This analysis has led Hazen to its recommendation to float the Main Zone as discussed in Section 8.1. IWA may reserve the option to reconsider a rezoning of the system.

### 9.1.6 Standard Operating Procedures and Facility's Manuals

Another program that IWA is working on implementing is the Standard Operating Procedures (SOP) and equipment manual for each facility. The standard operating procedures manual is used to describe the overall objective of the facility, setting configurations for each system scenario (facilities out of service), and mutual facilities that help maintain the pressures and/or flow, and the facility's importance in the overall operation of the system. Each SOP will include the Operational and Maintenance manual for each facility. Currently, the state of the manuals needs updating and improvement. It is recommended that IWA continue working on the updates or hire a consultant to complete them. It would be beneficial to provide an overall assessment of the equipment condition and consequence of failure analysis.

### 9.1.7 Reservoir Cleaning, Inspection, and Recoating

Another program that IWA has is the cleaning, inspection, and recoating of reservoirs within the system. Currently, IWA periodically has the reservoirs in the system inspected and cleaned annually to ensure the tanks do not need maintenance and sediment is removed from the bottom of the tanks. The last tank inspection was conducted in 2018. Most recently, IWA recoated the tanks at Plant 2 and Plant 3 in 2018.

### 9.1.8 Well Rehabilitation Program

Another program that IWA currently has implemented is the well rehabilitation program, where wells are video inspected for a condition assessment and rehabilitation is performed on the well. Currently, IWA owns and operates 20 wells. Historically, IWA rehabilitates two to three wells annually. Well rehabilitation includes brushing, bailing, airlifting, and chemical treatment of the well. Most recently, IWA had Well U and Well 3B rehabilitated, and based on an amendment IWA submitted to the Water Authority and City Council on May 1, 2018, their costs were used to inform the annual budget of this program in the CIP.

### 9.1.9 Building Rehabilitation Program

Another program IWA previously implemented is the building rehabilitation program where buildings at the various wells are replaced. IWA would like to rehabilitate old well buildings at Wells S, T, U, W, and Z. The proposed schedule is the rehabilitation of one building per year until all the old buildings are replaced. For cost estimating purposes the building construction cost for Well 13A was used. It is recommended that well rehabilitation be coordinated with the building rehabilitation to maximize cost efficiencies.

## 9.2 Proposed Operating Programs

IWA is looking for new programs to be implemented to improve operation efficiency, reliability, and level of service. If considered, these programs would be added to the next water master plan. Below are several operational programs for consideration by IWA.

### 9.2.1 Hydrant Exercising Program

Hydrants are important life saving devices during fire, automotive and nature disasters and need to be available to first responders immediately. Currently, IWA does not have specific hydrant exercising program but hydrant exercising is performed as part of the valve exercising program. It is recommended that IWA continue to exercise the existing hydrants throughout the system to ensure operational readiness of the hydrants. Hydrants with maintenance needs or replaced will be identified and placed on the hydrant replacement program.

### 9.2.2 Pump efficiency Testing and Long-Term Operational Tracking Analysis

As part of a larger program, IWA has implemented a pump efficiency and motor testing program which should be continued. The testing results are tracked to allow IWA to repair, service and replace motors or pumps in a timely manner by tracking declining performance in motors and pumps. The tracking can be performed by entering pump efficiency test results into a Microsoft Excel spreadsheet to observe declines in performance.

### 9.2.3 Key Performance Indicator and Energy Dashboarding

Another option for IWA is to use real time data to monitor performance by utilize sub-metering power readings and hydraulic output (i.e., flow and TDH) to track the performance of the pump with respect to real-time, on-line wire-to-water efficiency and energy intensity (kWh/MG and kW/MGD) trending used to track the fitness of the pump and optimize operation while reducing costs.

### 9.2.4 Vertical Asset Management

Currently, IWA has a robust horizontal asset program through its Cityworks program. However, the vertical asset program needs to be implemented for tracking, monitoring, and performance monitoring for preventative maintenance before failure. Currently, facilities like reservoirs, booster stations, wells, and the associated equipment are not tracked. Implementing a vertical asset management program would save IWA money over the long term.

### 9.2.5 Pipe Looping Program

A pipe looping program should be considered by IWA for long term level of service reliability and improve water age in the system. In addition to the looping projects proposed in the CIP, IWA may implement a program for other miscellaneous pipeline looping in the distribution system. Looping dead end pipelines where feasible helps improve the water quality, water age, and system pressures, which may result in flatter system curves for the pumps in the system. Flatter system curves result in lower required horsepower for pump motors to reach the equivalent flow due to lower total dynamic head requirements at existing operational constraints.

### 9.2.6 Air Valve Audit Program

Conduct an air valve audit to identify portions of the system that may be air locked and contributing to hydraulic choking, low pressures, elevated energy intensity, increased potential for hydraulic transients, and cloudy water complaints.

### 9.2.7 Emergency Generator Program

Emergency generators must be routinely testing and maintained in order to ensure their operability during emergency events. This program is to equip, test, and maintain facilities critical to supplying the distribution system with permanent emergency generators and less critical facilities with hookups for portable generators.

### 9.2.8 Water Utility Operational and Business Computer System Program

IWA owns and operates its own IT, communications systems, software, and SCADA system for water utility facilities such as wells, booster stations, and reservoirs. Additionally, it owns business system software and customer service portals. Below is a budgetary summary for the Information Technology (IT), Communications, and Supervisory Control and Data Acquisition (SCADA) Software and Hardware Updates and Replacements. It important to maintain both the software and hardware platforms to ensure reliable operations within the water utility environment. The previously described operational and business computer systems consist of the following:

#### *9.2.8.1 Communications*

The water distribution control system communications consist of licensed MAS radios from the remote facilities. Radios are typically upgraded every five years and replaced every ten years. Additionally, as facilities are added new towers are installed to improve the existing radio coverage or expand the coverage to the newly added facilities or provide communication redundancy. The work includes the following:

- Radio and license
- Tower (estimated 30 ft). It is assumed power is available at site)

#### *9.2.8.2 Information Technology:*

IT consists of components required to provide information to customers, and the public. However, it also provides security against hostile hackers who would like to do harm or extort money from the agency by holding data hostage.

- Firewall Replacement needs to be replaced regularly to ensure the latest technology is utilized by IWA.
- Primary firewall replacement at the Corp Yard (2021)
- Secondary Domain Controller Replacement (2019-2020)
- Copier/printer replacements
- Staff Computers
- Field mobility project – increase usage of tablets in the field

#### *9.2.8.3 SCADA*

The SCADA system is the hardware and software platform that monitors, controls, and archives data for the water distribution system that is the primary source of potable water for the IWA customers.

- SCADA System standby server replacement (2020-2021)
- SCADA network security implementation – hardware and consulting services (2019-2021)
- CCTV camera system upgrades for well/plant/reservoir sites (2019-2022)

#### *9.2.8.4 Software*

Ongoing support and maintenance contracts for critical IWA software systems. The current software systems are listed below:

- AutoCAD,
- Primavera P6,
- CityWorks,
- ArcGIS,
- Naviline,
- Laserfiche, and
- WaterGEMS

### 9.2.9 Energy Efficiency Improvement Program

IWA has implemented strategies recommended in the Pump Operational Plan Energy Model to reduced energy costs associated with pumping. IWA should continue to evaluate its closed zone pumping as energy costs increase. The energy efficiency improvement program needs to be re-evaluated to improve the operational costs throughout the IWA system by modifying the existing system to reduce energy consumption or take advantage stored energy that can captured and returned to the power grid.

#### *9.2.9.1 Hydro Generation Station*

Evaluate the feasibility of replacing the existing pressure reducing valve at Lost Horse Tank with a micro-turbine to generate electricity or mechanical power that can be used to offset power costs by IWA. As electrical cost increase, capturing the storage energy burned through the existing PRV can be captured by a micro-turbine to generate power that can be returned to the power grid or used at the Lost Horse Tank site.

# 10. Capital Improvement Program

IWA will endeavor to maintain its Capital Improvement Program (CIP) on a continuous basis. Hazen has provided IWA a dynamic CIP model that will aid in the naming, prioritizing, budgeting, and scheduling of projects in current and future iterations of the CIP. The sections below briefly describe the logic incorporated in the model.

## 10.1 Project Naming Convention

Each project is categorized using a nomenclature consisting of two abbreviations and a number. The first abbreviation pertains to the project's "Program Category". This consists of: "Capital Projects" (CIP); "Programs" (PRG) and "Uncompleted Projects from 2007 and 2012 WMP" (UNC) subcategories. The second abbreviation pertains to the project's "Type". This consists of: "Booster Station" (BPS); "Pipeline Projects" (P); "Pressure Reducing Valves" (PRV); "Reservoirs" (GT); "Surface Water Treatment Plant" (SW); "Telemetry" (TEL); "Wells" (W); "Maintenance Program" (MAINT); and Recycled Water (RW) subcategories. The remaining number represents the cardinal order of the groups of projects by category and type. Table 10-1 summarizes the naming convention.

**Table 10-1: Project Category and Type**

| Project Category | ABBR |
|---|---|
| Capital Projects | CIP |
| Programs | PRG |
| Uncompleted Projects from 2007 and 2012 WMP | UNC |

| Type | ABBR |
|---|---|
| Booster Station | BPS |
| Pipeline Projects | P |
| Pressure Reducing Valves | PRV |
| Reservoirs | GT |
| Surface Water Treatment Plant | SW |
| Telemetry | TEL |
| Wells | W |
| Maintenance Program | MAINT |
| Recycled Water | RW |

## 10.2 Priority Criteria

Following an internal review of the CIP and consultation with IWA, a preliminary schedule was set for each project in the CIP. The fiscal year for a project's preliminary completion date, along with seven criteria points were used to assess the priority of each project. Table 10-2 summarizes the Priority Criteria. A pairwise comparison was used to weight the criteria and the weighted scores were applied to all projects. Any project that required completion in a given fiscal year was given a fixed project end year. Other projects were reallocated amongst the fixed end year projects by priority. The reallocation involved the setting the initial annual budget based from IWAs current fiscal year, increasing the budget annually by about 4.5 percent, and moving projects by priority and ability to complete. Durations for each project were set by a table of standardized unit durations (see Table 10-3).

**Table 10-2: Priority Criteria**

| Criteria | Question |
|---|---|
| Regulatory Driven Projects | How well does this project conform to existing regulations? |
| Health and Safety, Fire Flow | How effective will this project be in maintaining adequate health, safety and fire flow standards? |
| System Performance/Customer Service | How effective is this project in terms of improving system performance and customer satisfaction? |
| Client Direction | What is the level of emphasis placed on this project from IWA? |
| Supply Needs | How well does this project alleviate supply needs? |
| Energy Efficiency | How much does this project contribute to maximizing the energy efficiency of the system? |
| Aging Facility Replacements | How much does this project contribute to the replacement of aging facilities in the system? |

**Table 10-3: Project Unit Duration**

| Type | ABBR | Rate of completion (per year) | Units |
|---|---|---|---|
| Booster Station | BPS | 3 | MGD |
| Pipeline Projects | P | 12,000 | LF |
| Pressure Reducing Valves | PRV | 50 | Count |
| Reservoirs | GT | 1.5 | MG |
| Surface Water Treatment Plant | SW | 0.82 | MGD |
| Telemetry | TEL | 1 | Count |
| Wells | W | 1,500 | gpm |
| Maintenance Program | MAINT | 1 | Count |
| Recycled Water | RW | 0.82 | MGD |

## 10.3 Cost Basis

Estimated project costs are considered Class 4 as defined by AACEi. The class designation is determined based upon the information available for estimation and the maturity of the design. In general, Class 4 estimates are expected to have a typical accuracy range of –30% to +50%.

Project construction costs were determined in one of three ways. If the project was part of the existing CIP then its construction cost was escalated to reflect 2019 dollars. Escalation was calculated using Engineering News-Record (ENR) Construction Cost Index (CCI) from either 2007 or 2012 to 2019 dollars.

For new projects which were not part of the existing CIP but which contained scope similar to existing CIP projects, the average escalated construction unit cost from existing CIP projects was used (i.e. $/lf-in, $/mgd, $/MG, etc.). In these cases, the construction cost was calculated as a straight multiplication of unit versus cost per unit.

For the remaining projects which were not part of the existing CIP and were not of a similar scope, a high-level conceptual construction estimate was developed. Major scope items were identified and costed out. Ancillary disciplines were calculated as a percentage of construction cost. The percentages used for civil, structural, electrical, instrumentation and control, HVAC and mechanical varied depending upon the nature of the project and were based upon experience with similar type projects. For these projects, wage rates were based on current Department of Industrial Relations prevailing wages published for Riverside County, California, generally set to expire June 30, 2019. Craft Payroll Burdens and Benefits were carried based on Federal and California state requirements. Insurance rates were in accordance with state and craft requirements. A standard 5-day, 40-hour workweek was used; overtime, shift rates and premium time were not included. Crews, equipment, and productivity used for work items are based mostly on standards specific to each trade. Some information was supplemented by RS Mean's data and modified where necessary by estimator judgment. Equipment rates were primarily based on current published rental rates as listed in the EquipmentWatch Blue Book, but this was supplemented by RS Mean's data, the EquipmentWatch Green Book and local rental suppliers.

Construction costs for existing CIP projects or those projects calculated using unit rates from existing CIP projects were assumed to include contractor mark-ups and contingencies. For projects where a conceptual construction estimate was developed, the mark-ups shown in Table 10-4 were used:

**Table 10-4: Construction Cost Mark-Ups**

| Item | Percent (%) |
|---|---|
| General Conditions (Div01) | 8 |
| Contractor Overhead | 8 |
| Contractor Profit | 8 |
| Bonding and Insurance | 3 |
| Contingency | 25 |

Project total cost includes the cost of both construction as well as professional and administrative services required for project delivery. The Project total cost was calculated by multiplying the project construction cost by the following multipliers as shown in Table 10-5:

**Table 10-5: Project Total Cost Mark-Ups**

| Item | Percent (%) |
|---|---|
| Engineering | 9 |
| Environmental | 5 |
| Construction Management | 10 |
| Legal | 2 |
| Administration | 2 |

# Appendix A: Reference Documents

## Reference Documents

1. American Water Works Association M36 Water Audits and Loss Control Programs, Fourth Edition. 2016.

2. Cadiz, Inc. website. http://www.cadizinc.com/faq/

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5. Citrus Ranch Residential Development. Draft Water Supply Assessment, SB 610 and SB 221. October 19, 2006. Stantec Consulting, Inc.

6. Citrus Ranch Specific Plan. 2007. Stantec Consulting, Inc.

7. Citrus Ranch Specific Plan Water Supply Assessment and Verification. The Altum Group. June 20, 2012.

8. City of Indio website. http://www.indio.org/about/history.htm.

9. Coachella Valley Water District. Coachella Valley Water Management Plan Update Final Report. January 2012.

10. Coachella Valley Water District. Engineer's Report on Water Supply and Replenishment Assessment Mission Creek Subbasin Area of Benefit, West Whitewater River Subbasin Area of Benefit, East Whitewater River Subbasin Area of Benefit 2018-2019. April 2018.

11. Coachella Water Authority and Indio Water Authority. Chromium-6 Treatment and Compliance Study. August 2015. Hazen and Sawyer.

12. Indio General Plan 2010. October 1993. Chambers Group, Inc.

13. Indio General Plan 2020: Volume I. Chambers Group, Inc. Adopted October 1993. Amended November 1994.

14. Indio General Plan 2020: Volume II. Chambers Group, Inc. Adopted October 1993. Amended November 1994.

15. Indio Water Authority 2007 Water Master Plan Update. May 2008. Dudek.

16. Indio Water Authority 2010 Urban Water Management Plan. December 2011. Black & Veatch.

17. Indio Water Authority 2012 Water Master Plan Update. September 2012. Malcolm Pirnie.

18. Indio Water Authority 2015 Urban Water Management Plan. July 1, 2016. MWH Global.

19. Recycled Water Program Development Feasibility Study, Technical Memorandum No. 1, Indio Water Authority / Valley Sanitary District (East Valley Reclamation Authority). March 2018. Hazen and Sawyer.

20. United States Census Bureau website. https://www.census.gov/quickfacts/fact/table/indiocitycalifornia/PST045217

# Appendix B: Available Development Project Sites

**Available Development Projects List:**

- Indio 78 at Shadow Hills
    - Jefferson Street and Avenue 40
    - Tentative Tract Map No. 32869
    - 78 acres
    - 238 Residential Lots
- España
    - Adams Street and Avenue 40
    - Tentative Tract Map No. 31689
    - 102 acres
    - 330 Residential Lots
- España
    - Adams Street and Avenue 40
    - Tract Map No. 31689-1
    - 60 Acres
    - 154 Residential Lots
- Affresco
    - Jackson Street and Avenue 40
    - Tentative Tract Map No. 32401
    - 44 Acres
    - 140 Residential Lots
- Affresco
    - Jackson Street and Avenue 40
    - Tract Map No. 32401-1
    - 43 Acres
    - 138 Residential Lots
- Paradiso
    - Monroe Street and Avenue 41
    - Tract Map No. 31815-1
    - 73 Residential Lots
- Paradiso
    - Monroe Street and Avenue 41
    - Tract Map No. 31815
    - 104 Residential Lots
- Madrid
    - Calhoun Street and Avenue 43
    - Tentative Tract Map No. 31974
    - 29 Acres
    - 102 Residential Lots
- Shadow Ranch
    - Calhoun Street and Avenue 42
    - Tract Map No. 32149

    - 81 Residential Lots
- Lido at Terra Lago
    - Golf Center Parkway and Avenue 43
    - Tract Map No. 31601
    - 113 Residential Lots
- Dillon Lake Estates
    - Dillon Road and Avenue 44
    - Tract Map No. 29714
    - 45 Acres
    - 26 Residential Lots
- Monte Viña
    - Golf Center Parkway and Avenue 44
    - Tract Map No. 31562
    - 80 Acres
    - 301 Residential Lots
- Montana De Oro
    - Madison Street and Avenue 46
    - Tract Map No. 33435
    - 44 Residential Lots
- Las Plumas
    - Jackson Street and Avenue 49
    - Tract Map No. 33875
    - 43 Acres
    - 171 Residential Lots
- Barcelona
    - Avenue 50 and Jackson Street
    - Tentative Tract Map No. 32411
    - 40 Acres
    - 138 Residential Lots
- Stonefield
    - Madison Street and Avenue 49
    - Tract Map No. 32339-1
    - 21 Residential Lots
- Victoria Palms Villas
    - Monroe Street and Avenue 49
    - Tract Map No. 31170-1
    - 44 Acres
    - 460 Multi-family Units
- Gallery Links at Indian Palms
    - Jackson Street and Avenue 50
    - Tract Map No. 30501
    - 86 Residential Lots

- Cochran Ranch Estates
    - Jackson Street and Avenue 50
    - Tract Map No. 31389
    - 22 Acres
    - 86 Residential Lots
- Whittier Ranch
    - Jackson Street and Avenue 48
    - Tract Map No. 31473
    - 61 Residential Lots

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# 2019 Master Plan Update

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