CITY OF RIVERSIDE PUBLIC UTILITIES

Groundwater Atlas

2018

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CONTENTS

INTRODUCTION

The purpose of this Groundwater Atlas is to report the water quality and quantity conditions of the groundwater basins that provide potable and non-potable water supplies to Riverside Public Utilities' (RPU) customers. This Atlas will support RPU's groundwater management strategies and activities related to managing water supplies in a sustainable and resilient manner.

RPU provides potable water, non-potable water, and recycled water to the City of Riverside (City). RPU currently serves water to a population of about 310,500 people through approximately 65,000 service connections within a service area of 75 square miles. In addition, RPU also provides surplus potable and nonpotable water to Western Municipal Water District, who serves City residents outside of the RPU service area. A small amount of potable water is also supplied to the City of Norco via a wholesale agreement. Since 2009, all the City's potable water demand has been supplied solely from local groundwater as established by the court's Western-San Bernardino 1969 Judgement.

The condition of the groundwater basins is dynamic and influenced by activities and changes outside of RPU's control, including groundwater contamination from past agricultural, industrial, and defense practices, natural variations in weather patterns, actions by other agencies, and evolving State and Federal regulations. These basins are shared with other water purveyors and their associated water infrastructure, including well fields, groundwater recharge facilities, and wastewater treatment plants. The operation of these facilities combined with regional hydrologic variance adds to the complexity of managing these resources. This underscores the importance of remaining engaged at both the local and regional levels and for RPU staff to track annual changes in groundwater basins to ensure an adequate and sustainable water supply is available for current and future generations. All data portrayed in this 2018 Groundwater Atlas was generated from January 1, 2018 to December 31, 2018.

This 2018 Groundwater Atlas illustrates the current condition of the groundwater basins with respect to hydrology, production, recharge, groundwater levels, and groundwater quality. The purpose of this Groundwater Atlas is to:

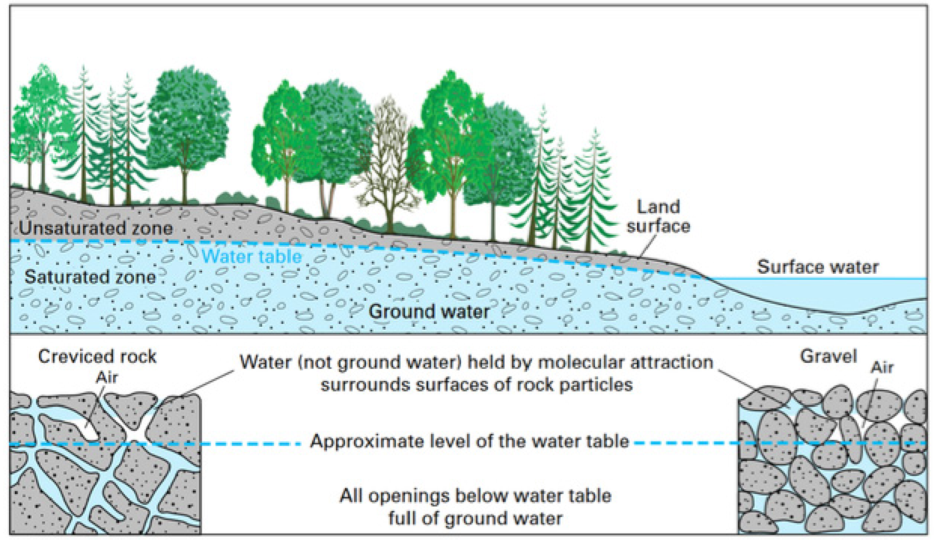
- Characterize groundwater basin conditions and how they change over time.
- Provide readable and reliable data to customers, elected officials, executive management, and staff.
- Provide information and analysis to RPU staff for use in managing the City's water supply.
- Protect RPU's strong water supply position and financial stability.

City of Riverside skyline.

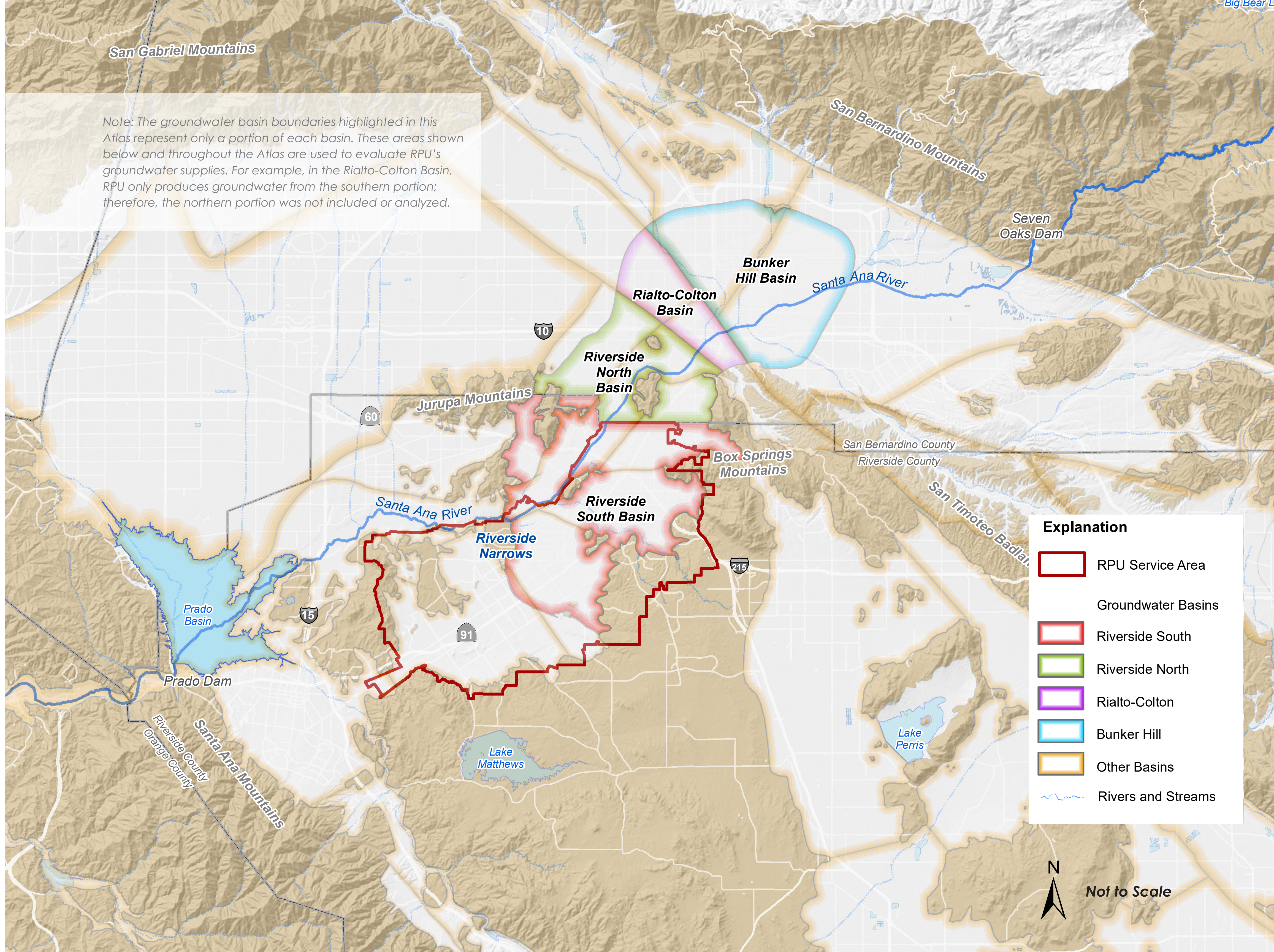
ABOUT OUR GROUNDWATER BASINS

The City of Riverside was developed around the once prolific water supply of the Santa Ana River. Our groundwater basins are highly influenced by the tectonic forces of the San Andreas and San Jacinto faults. The San Jacinto fault limits the movement of groundwater and forces shallow groundwater to the surface. The San Jacinto Fault in conjunction with semi-confining clay zones helped to pressurize portions of the groundwater beneath the City of San Bernardino. As the surface waters of the Santa Ana River diminished from weather patterns and development in the region from the late 1800s, RPU took advantage of the seismically-influenced groundwater basins to drill and construct artesian wells. The artesian wells acted as a conduit, allowing pressurized water to escape freely from the ground. As these pressures and high groundwater levels decreased in the early 1900s, RPU began equipping these groundwater wells with pumps. Today, groundwater levels and pressures have subsided to some of the lowest levels in recent times. However, the aquifer remains a prolific and productive source for local groundwater.

RPU's water supplies come from groundwater basins consisting of underground geologic formations called aquifers that are fed by rain and snow melting in the San Bernardino Mountains and local foothills and is illustrated in the graphic below. RPU produces water from four groundwater basins adjacent to the Santa Ana River including the San Bernardino, Rialto-Colton, Riverside North and Riverside South Basins as shown in the figure on the adjacent page. Over the years, RPU has constructed facilities that have allowed for wise utilization of groundwater resources to become completely independent of imported water supplies.



Credit: USGS, Public Domain



Enhanced Recharge on the Santa Ana River

1

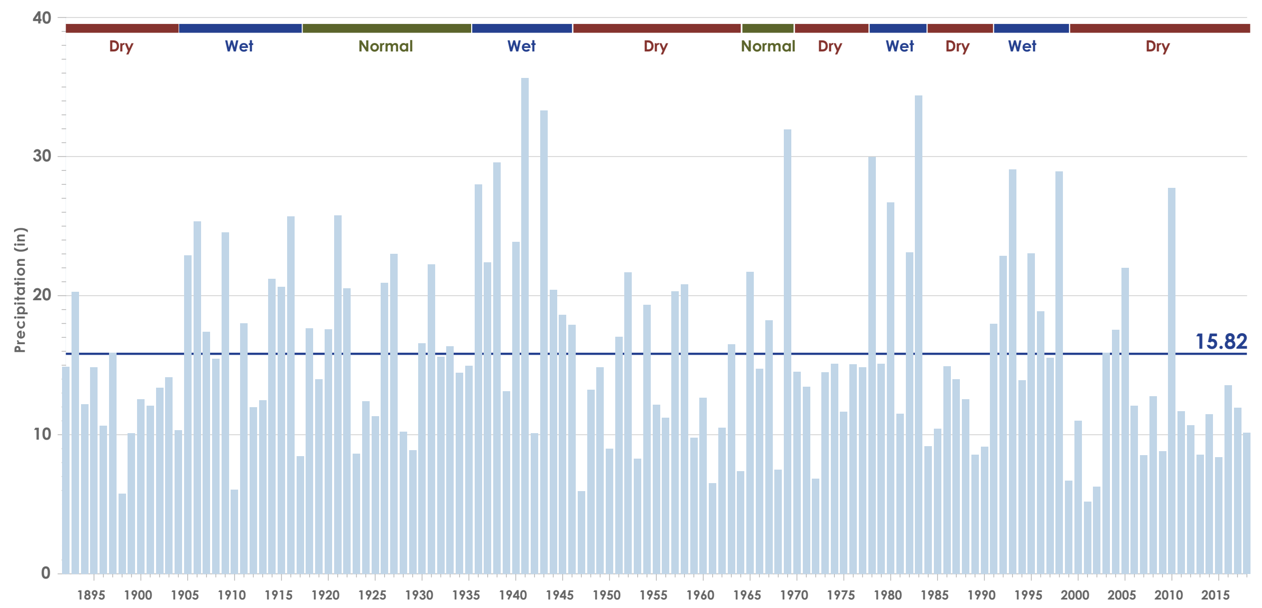
HYDROLOGIC CONDITIONS

1 HYDROLOGIC CONDITIONS

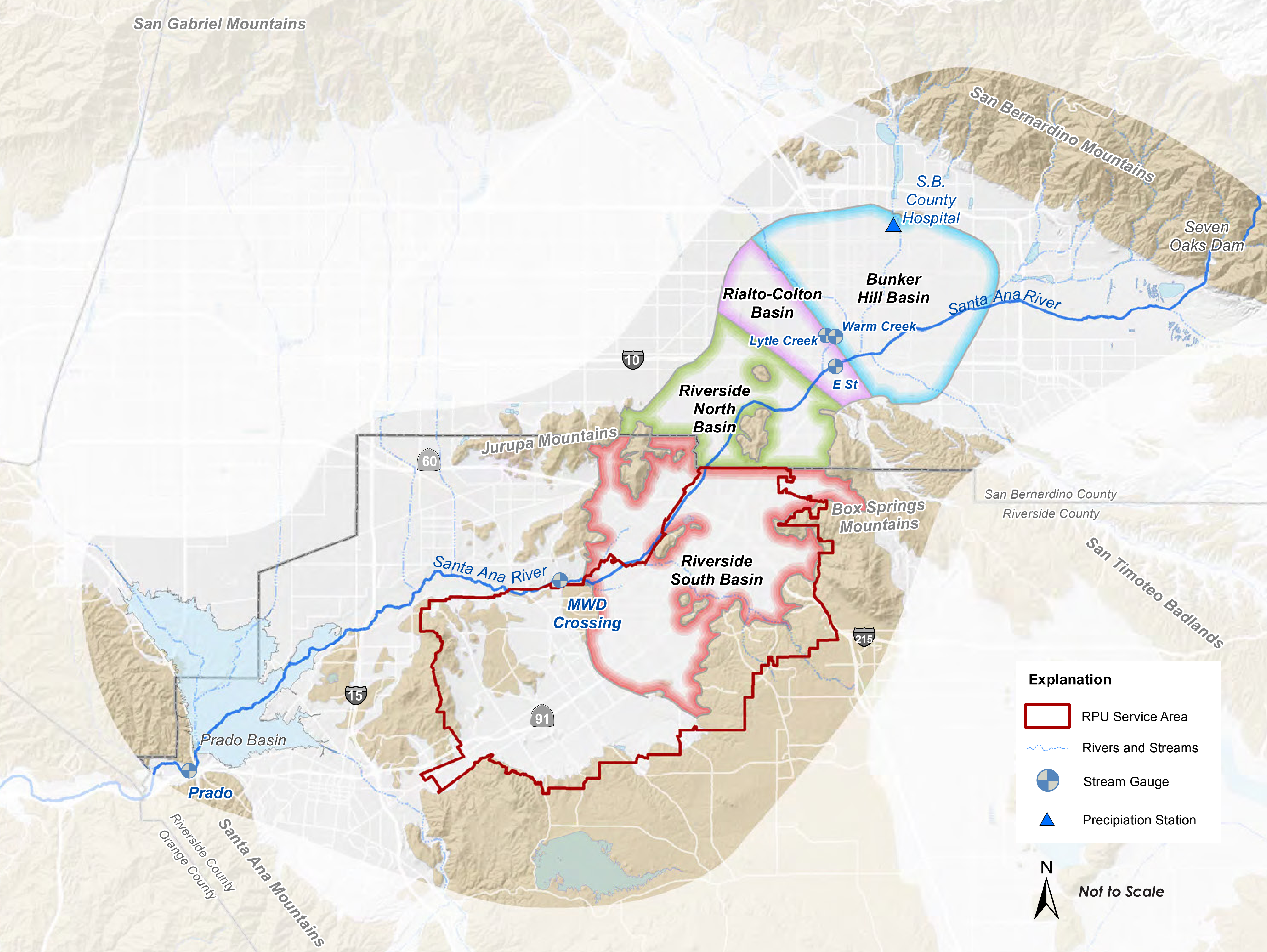
Both regional and local hydrologic conditions vary year to year and understanding the relationships between meteorological, surface water, groundwater, and biological factors that influence the flow, quality, and recharge of water in a groundwater basin is important and can have significant impacts on local water supplies.

RPU participates in monitoring the hydrologic conditions of the region through measurements of precipitation and flow in the Santa Ana River and its tributaries. The primary source of recharge to the groundwater basins is precipitation. The region uses a precipitation gage of San Bernardino County to characterize long-term meteorological conditions. The chart below characterizes the occurrence and magnitude of wet, dry, and normal periods of precipitation. The average annual rainfall over historical record was about 15.82 inches and 12.30 inches in the last 10 years (2008 – 2018) during an extended dry period.

Historical Annual Precipitation *(San Bernardino County Hospital Gage)*

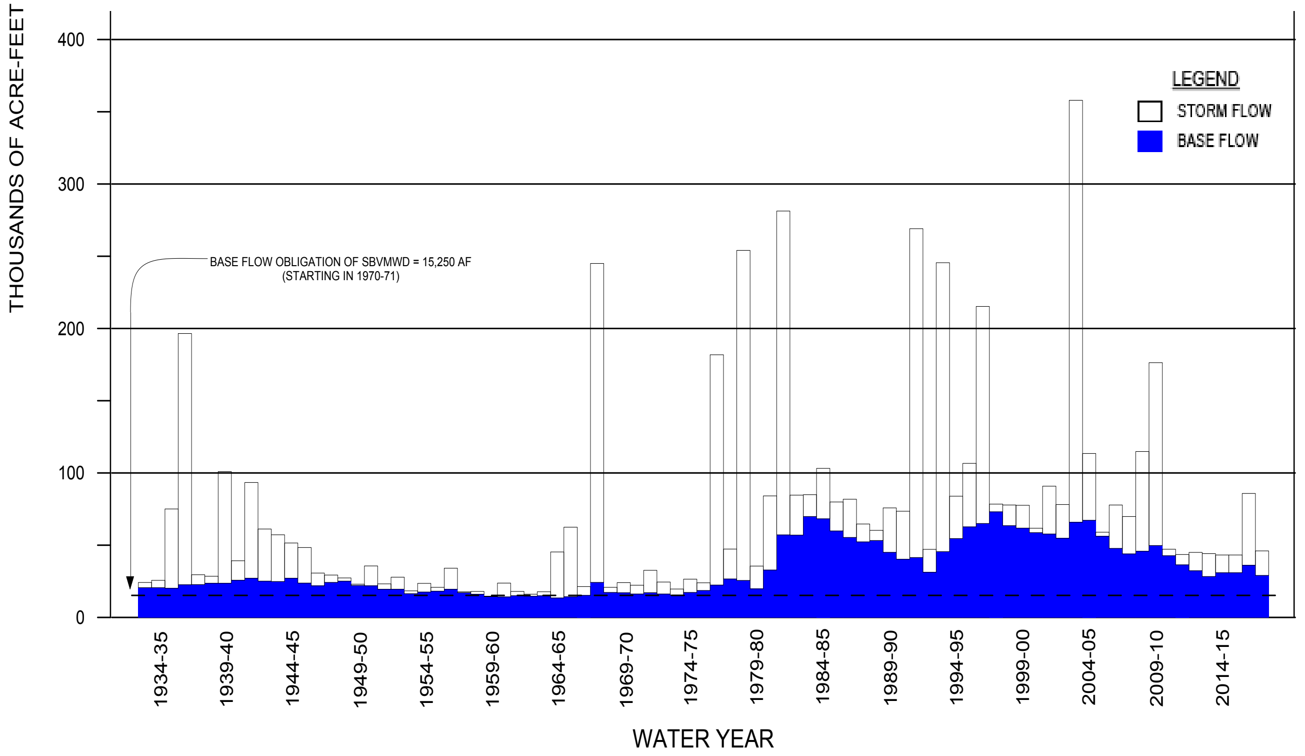


San Bernardino's average annual precipitation over the last 126 years is 15.82 inches.



The Santa Ana River Watermasters characterize the hydrology in the region by quantifying the flow in the Santa Ana River at Riverside Narrows, and RPU monitors the data. The flow is measured by the United States Geological Survey (USGS) at a gaging station named Santa Ana River at MWD Crossing (USGS-11066460) near the Riverside narrows. It is shown graphically in the chart below as baseflow and stormflow and on the figure on the previous page. Baseflow is the portion of streamflow that is sustained between precipitation events and primarily consists of effluent from municipal wastewater treatment plants located along the river as well as groundwater rising to the surface due to shallow bedrock. Minimum baseflow discharges were identified by water managers in the 1960s to ensure that everyone along the Santa Ana River had enough water supplies for beneficial uses. The data is utilized to measure compliance with water rights, ensuring that the Orange County agencies have the quantity and quality that was agreed to in the 1969 Judgment.

Discharge of Santa Ana River at Riverside Narrows starting with 1934-35



Credit: Forty-Eighth Annual Report of the Santa Ana River Watermaster for Water Year October 1, 2017 - September 30, 2018

Santa Ana River looking upstream

RPU Production Well

2

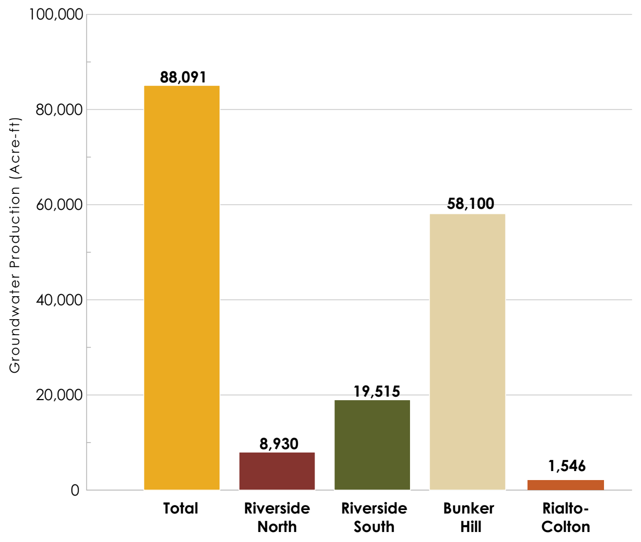
GROUNDWATER RESOURCES MANAGEMENT

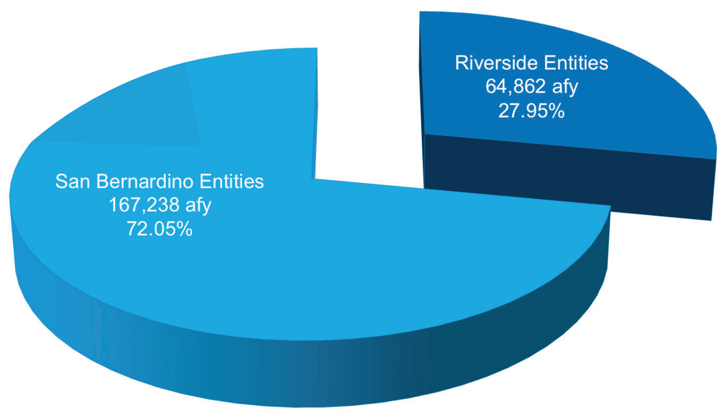
2 GROUNDWATER RESOURCES MANAGEMENT

The City started developing water supplies from the region in the 1870s. Since this time, RPU and its customers/owners have continually improved its water conveyance system and have strategically and cost-effectively developed the City's water supply from key locations within the groundwater basins.

RPU has continued to keep its customers and decision-makers informed with the best available data and best management practices that have led to strong regional water rights and superior water quality by holding responsible parties accountable. The City actively defends its water rights, which were clearly defined in the 1969 Judgment. RPU management maintains a close dialog with the Western-San Bernardino Watermaster to ensure groundwater compliance is maintained. As the groundwater conditions continue to change and new challenges emerge, RPU continues to assess the groundwater conditions and inform its customers and public representatives of the conditions and the best management practices to move the City forward with a sustainable water supply portfolio of local water supplies.

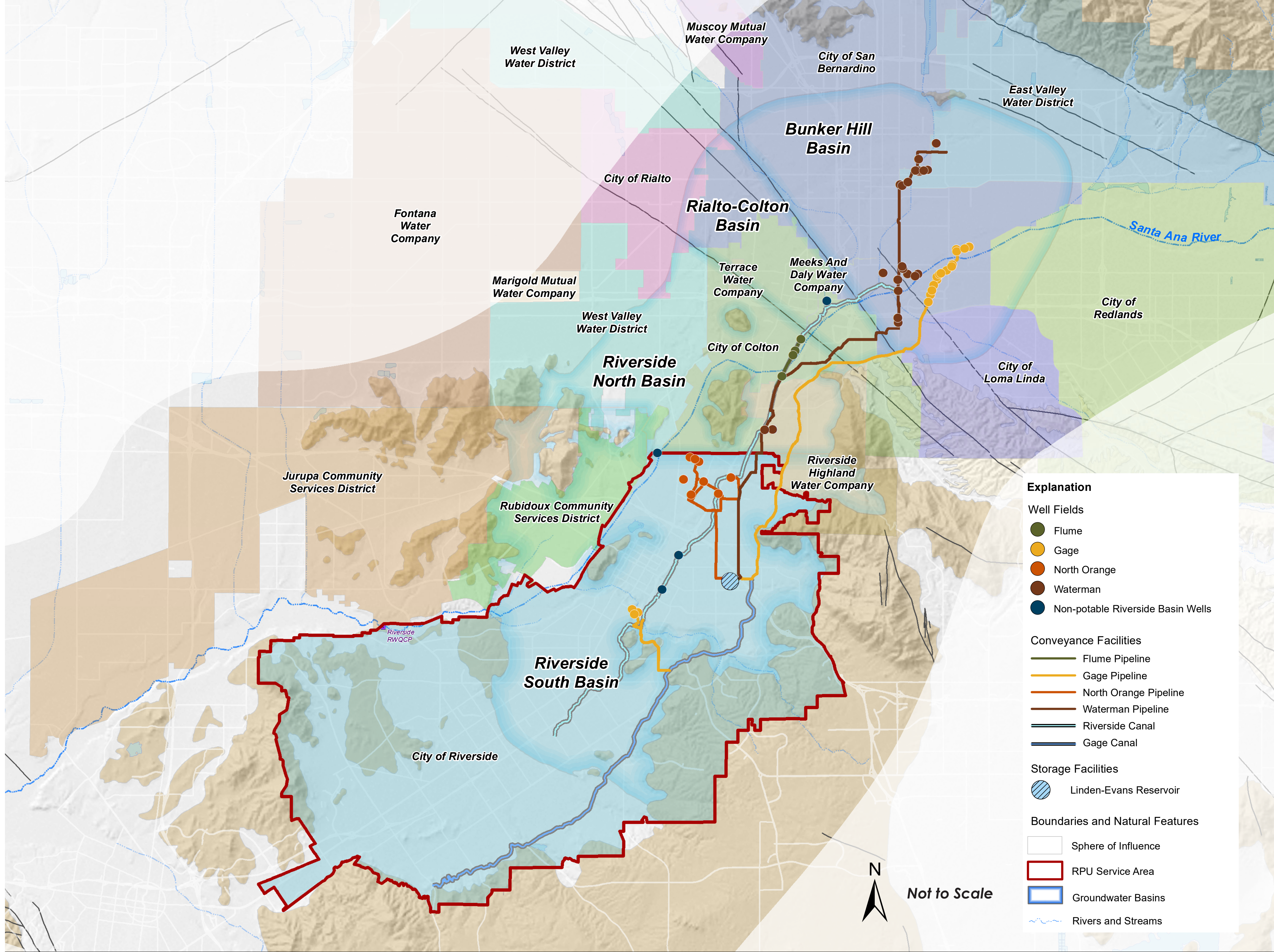
Groundwater Production by Basin





The original division of water resources in the San Bernardino Basin Area.

Source: Physical Solution Western-San Bernardino Watermaster



Inside view of a new well wire wrap screen prior to installation into a borehole. The well screen provides a connection from the groundsurface to the suburface aquifers to extract water from the ground.

3

GROUNDWATER PRODUCTION

3 GROUNDWATER PRODUCTION

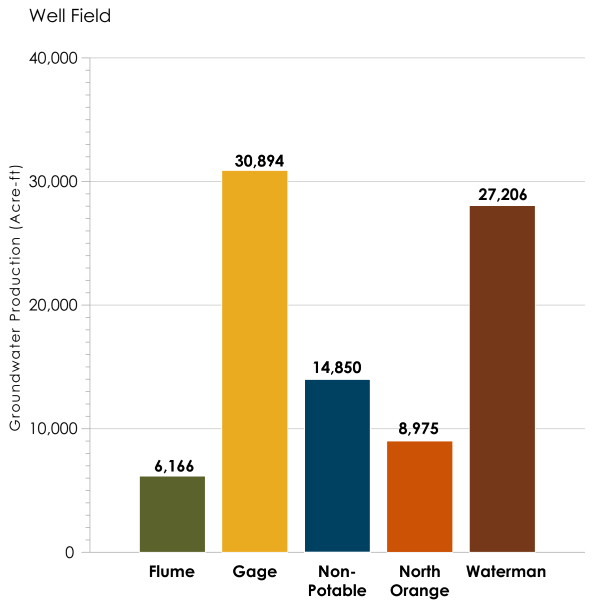
RPU has over 50 wells located in five well fields that produce groundwater from the Bunker Hill Basin, Riverside North and Riverside South groundwater basins. The majority of groundwater is produced from the Waterman and Gage well field located in the Bunker Hill Basin.

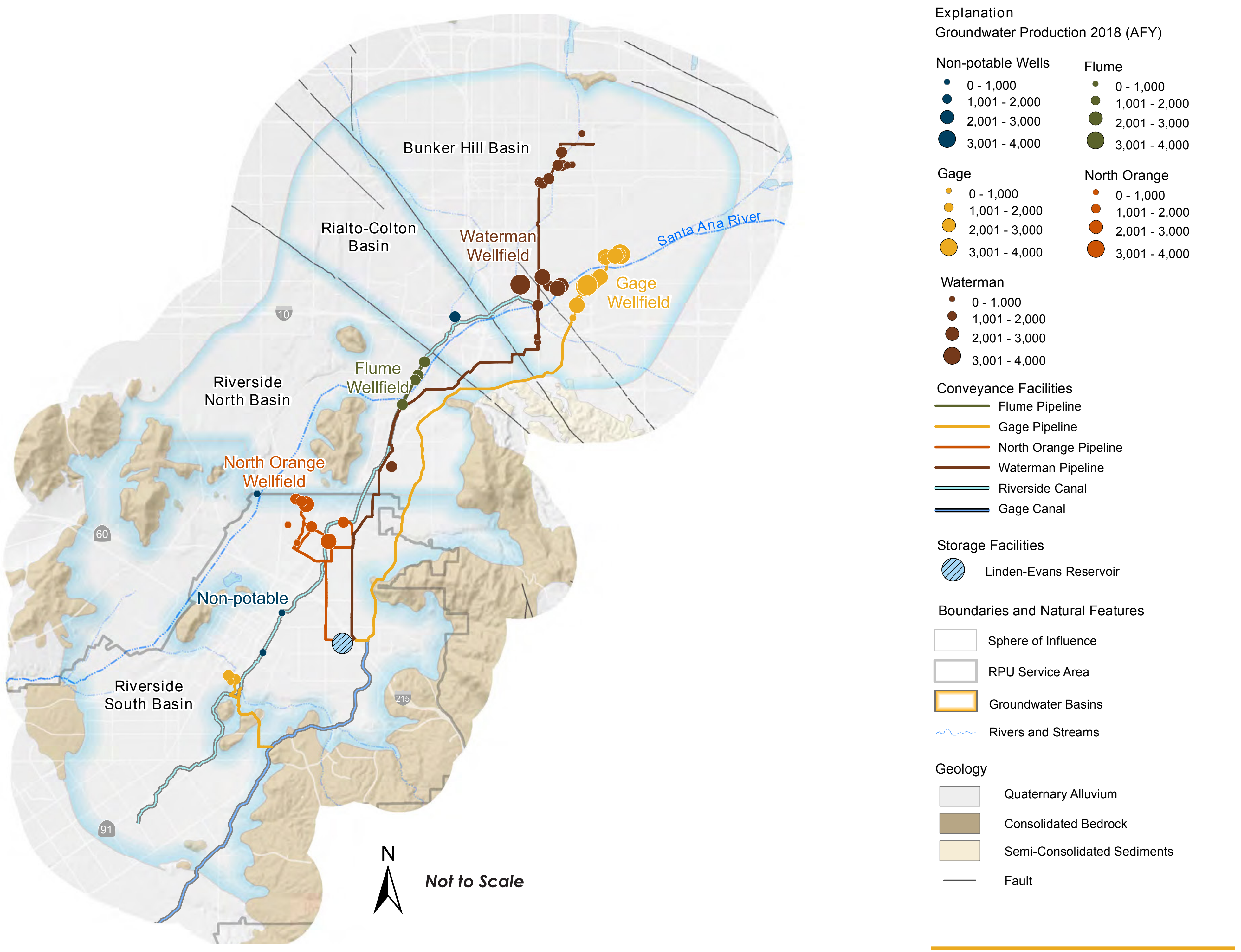
Groundwater extracted from the groundwater basins is conveyed via pipeline to RPU's potable or non-potable distribution based on the well location and demand. Raw groundwater from all of RPU's wells receive some form of treatment prior to entering the potable distribution system. In 2018, RPU operated 49 active potable water wells and 7 active non-potable water wells, for a total of 56 active wells. In addition, a portion of the treated potable water produced along the Gage pipeline is used for irrigation purposes by Gage Canal Company customers located within Riverside's "Greenbelt".

Since 2009, 100% of RPU's water supplies have solely originated from the Flume, Gage, North Orange, and Waterman well fields. RPU's wells are generally located in the section of the basin with the greatest thickness of water-bearing layers which allows the maximum groundwater production potential. Approximately 88,091 acre-feet, equal to 28.7 billion gallons, of water were extracted from aquifers in 2018 to supply water to the RPU service area. The Western-San Bernardino Watermaster prepares an annual report presenting groundwater production data, while the Santa Ana River Watermaster prepares an annual report on the surface water flows along the Santa Ana River. These annual Watermaster reports are issued annually to measure compliance with the 1969 Judgment, which set surface water and groundwater rights for the region.

Flume #7 Well

Groundwater Production by Well Field in 2018





Linden-Evans Reservoir

4

GROUNDWATER FACILITIES

4 GROUNDWATER FACILITIES

RPU has a vast network of conveyance facilities to deliver the groundwater produced from the basins to its customers through wells, treatment facilities, pipelines, reservoirs, and canals. RPU relies on these facilities and maintains them to ensure a reliable water supply throughout every season of the year.

Local groundwater supplies account for most of RPU's water supplies, with 100 percent originating from the Flume, Gage, North Orange, and Waterman well fields. RPU's wells are generally located in the section of the basin with the greatest thickness of water-bearing layers which allows the maximum groundwater production potential. Approximately 85,072 acre-feet or 27.7 billion gallons of water were extracted from aquifers in 2018 to supply water to the RPU service area. Reports are prepared annually presenting groundwater production data including water quality and safe yield of groundwater.

Groundwater Well Production and Pipes

WATERMAN

- **22** Production Wells
- Producing **27,206** acre-feet in 2018
- Maximum monthly demand **2,987** acre-feet in 2018
- **14.13** miles of pipeline
- **72** inches max pipe diameter

NORTH ORANGE

- **8** Production Wells
- Producing **8,975** acre-feet in 2018
- Maximum monthly demand **1,607** acre-feet in 2018
- **6.4** miles of pipeline
- **60** inches max pipe diameter

GAGE

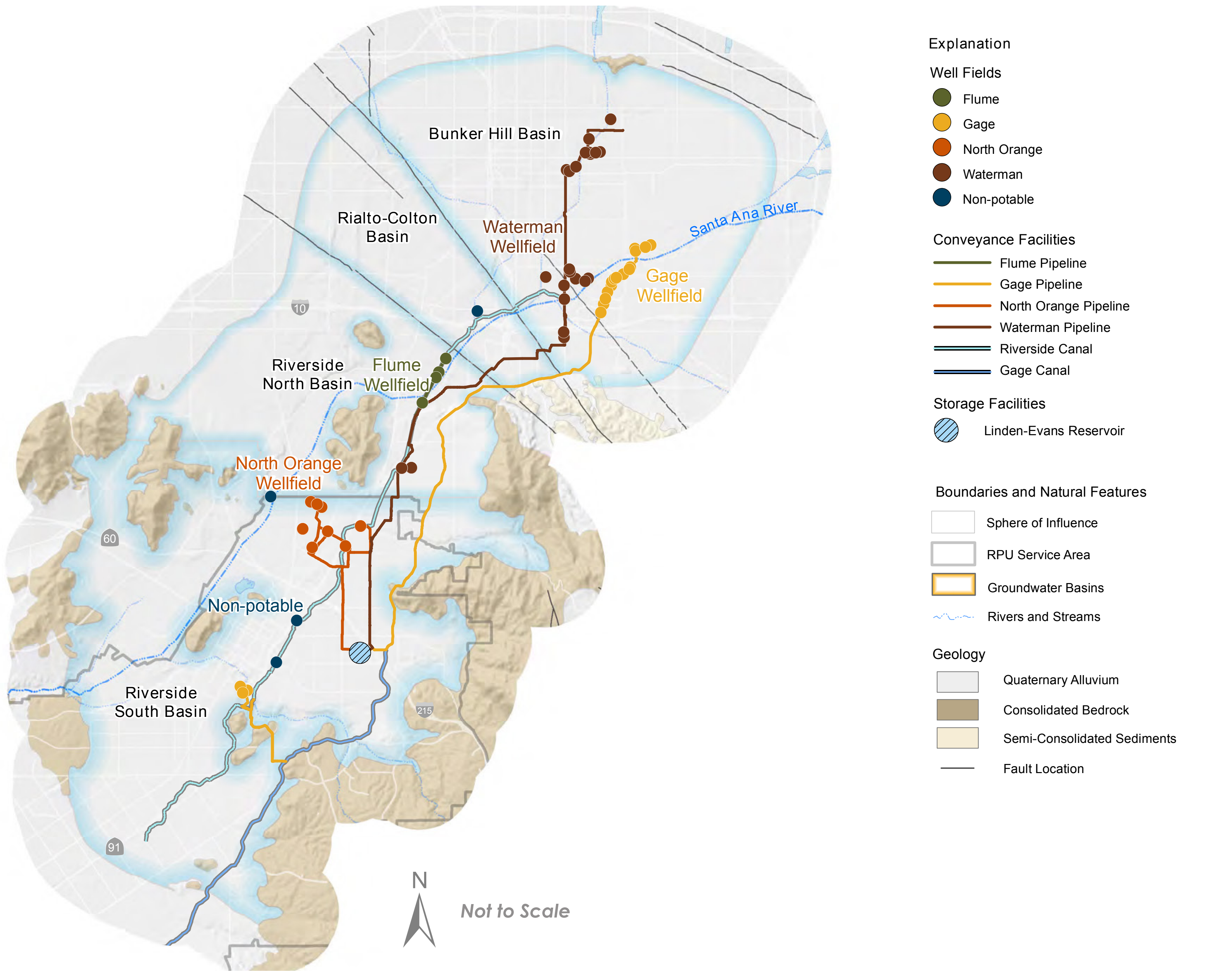
- **16** Production Wells
- Producing **30,894** acre-feet in 2018
- **4,752** acre-feet of non-potable
- Maximum monthly demand **2,799** acre-feet in 2018
- **14.6** miles of pipeline
- **60** inches max pipe diameter

FLUME

- **4** Production Wells
- Producing **6,166** acre-feet in 2018
- **703** acre-feet of non-potable
- Maximum monthly demand **662** acre-feet in 2018
- **1.16** miles of pipeline
- **48** inches max pipe diameter

NON-POTABLE

- **7** Non-Potable Wells
- Producing **14,850** acre-feet in 2018
- Maximum monthly demand **1,518** acre-feet in 2018



RPU Staff collecting a groundwater level measurement from a monitoring well.

5

GROUNDWATER LEVELS

5

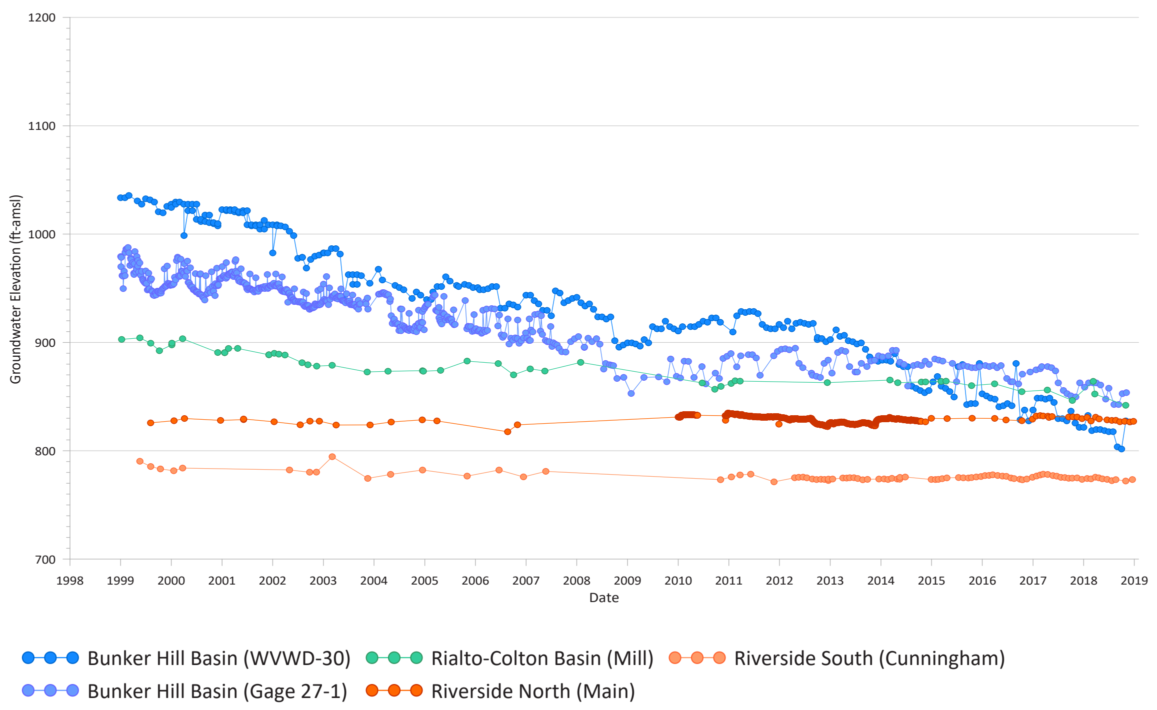
GROUNDWATER LEVELS

Overall groundwater conditions—specifically water levels—are unique to each basin. Tracking water levels throughout a basin can be used to understand how water levels respond to varying conditions (i.e., drought, groundwater pumping, recharge). RPU routinely measures water levels from their wells and uses this data to evaluate both short- and long-term trends. By collecting and evaluating this data and understanding what is driving the changing conditions, RPU can be environmental stewards and better plan, work collaboratively with other local water agencies, and focus future investments to ensure a reliable groundwater supply for the future.

In 2018, RPU obtained over 100 water level measurements to determine the depth-to-water, flow direction, and gradient of groundwater in each basin. Groundwater elevations are calculated by subtracting the water level measurement from the surface elevation at each well. This information is then compared to historical data to identify trends in recharge and groundwater usage. Groundwater elevations are also contoured to identify pumping depressions, areas of higher gradient, or areas that may be lower depths to groundwater than anticipated. Over the last 20 years, average groundwater elevations have dropped over 100 feet in the Bunker Hill Basin with some areas having 200 feet in groundwater elevation change.

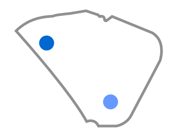
This section displays a series of maps showing the groundwater levels in 2017 and 2018 and the change in groundwater levels from 2017 to 2018. To illustrate the change in groundwater levels over the last 10 years, corresponding to the most recent drought, groundwater elevation contours were generated for 2008 and 2018 and the change in water levels.

Groundwater Levels by Basin



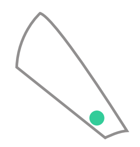
The figure above shows a time series of groundwater levels from representative wells located in Riverside's sphere of influence, overlying the groundwater basins from 1999 to the end of 2018. Each dot represents a groundwater level measurement and is plotted over time to identify trends. The chart shows how groundwater basins respond to hydrologic conditions and groundwater pumping. The groundwater levels in the Bunker Hill Basin represent a lowering trend of groundwater levels. For example, WVWD-30 located in the Bunker Hill Basin, shows groundwater level declines of about 10 ft per year over the almost 20-year time period. Groundwater levels in the other basins have been relatively stable with water level declines of less than 1 ft/yr.

Rate of Groundwater Level Decline from 1999 to 2018 within RPU's Sphere of Influence



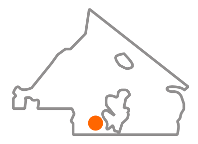
BUNKER HILL

Decline of about 8 ft/yr



RIALTO-COLTON

Decline of about 0.5 ft/yr



RIVERSIDE NORTH

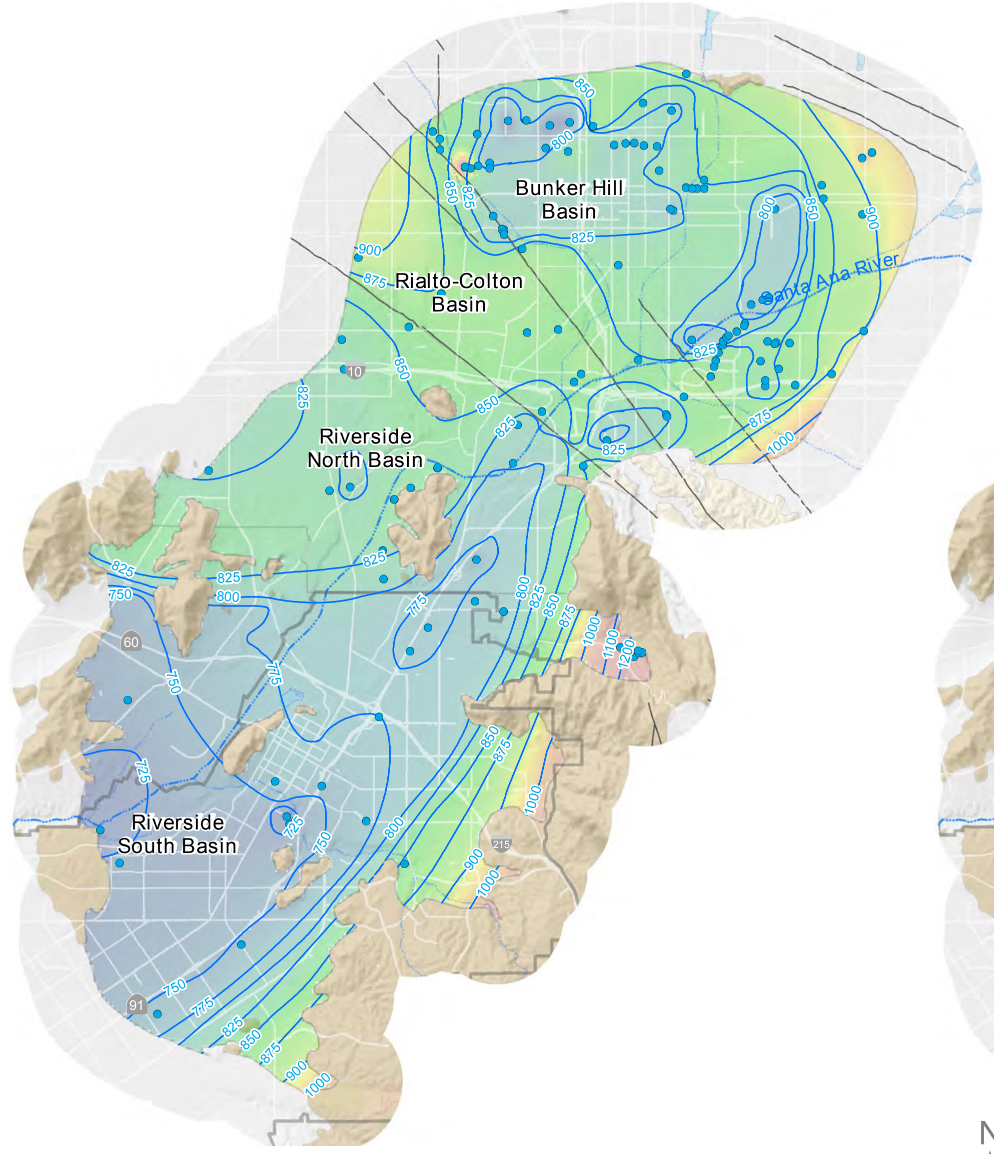
Decline of about 0.75 ft/yr

RIVERSIDE SOUTH

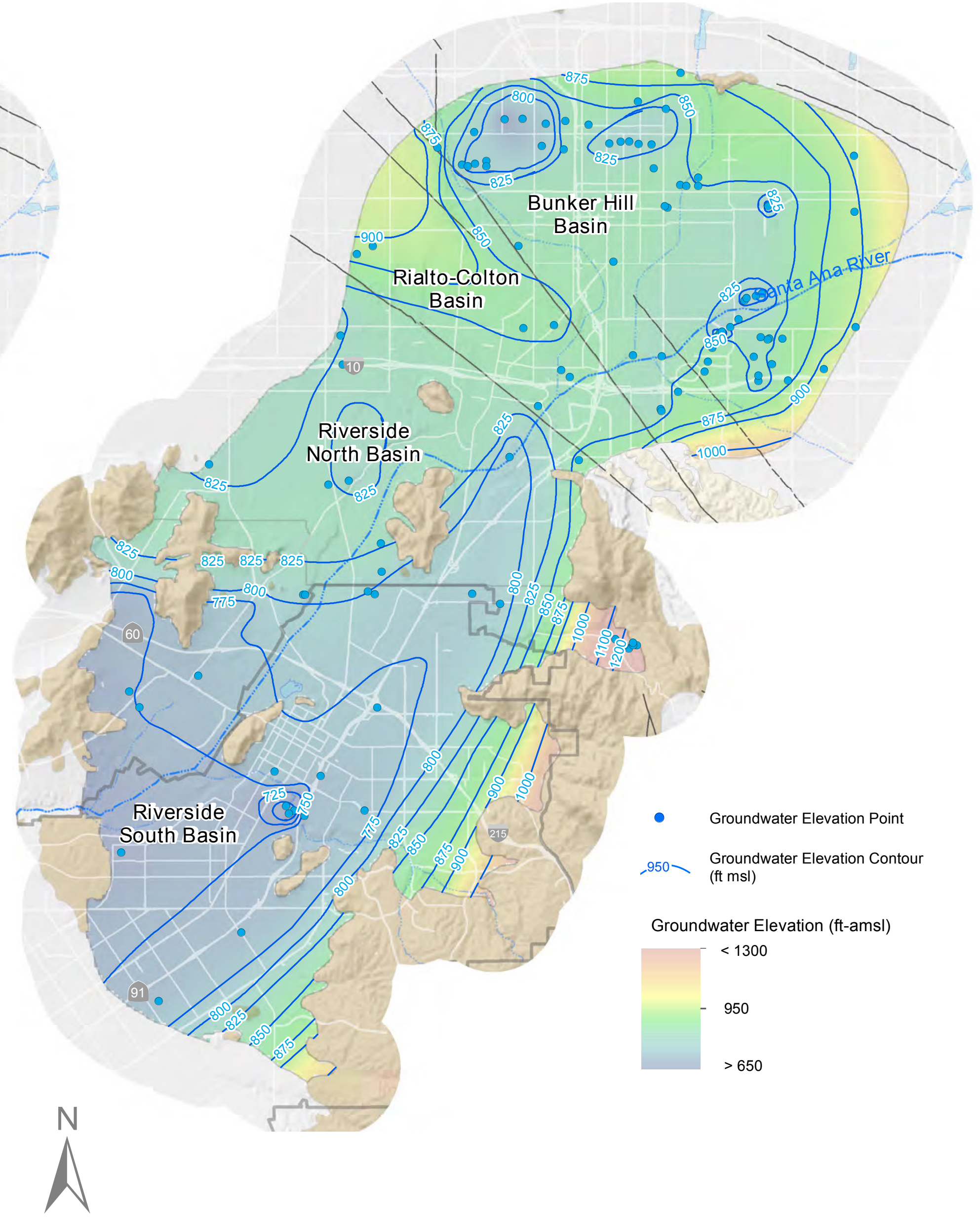
Decline of about 0.5 ft/yr

1-YEAR CHANGE

Groundwater level surfaces for Fall 2017 and 2018 within portions of the basins are shown as contours in the two maps below. RPU staff utilizes this information to mange their groundwater facilities.

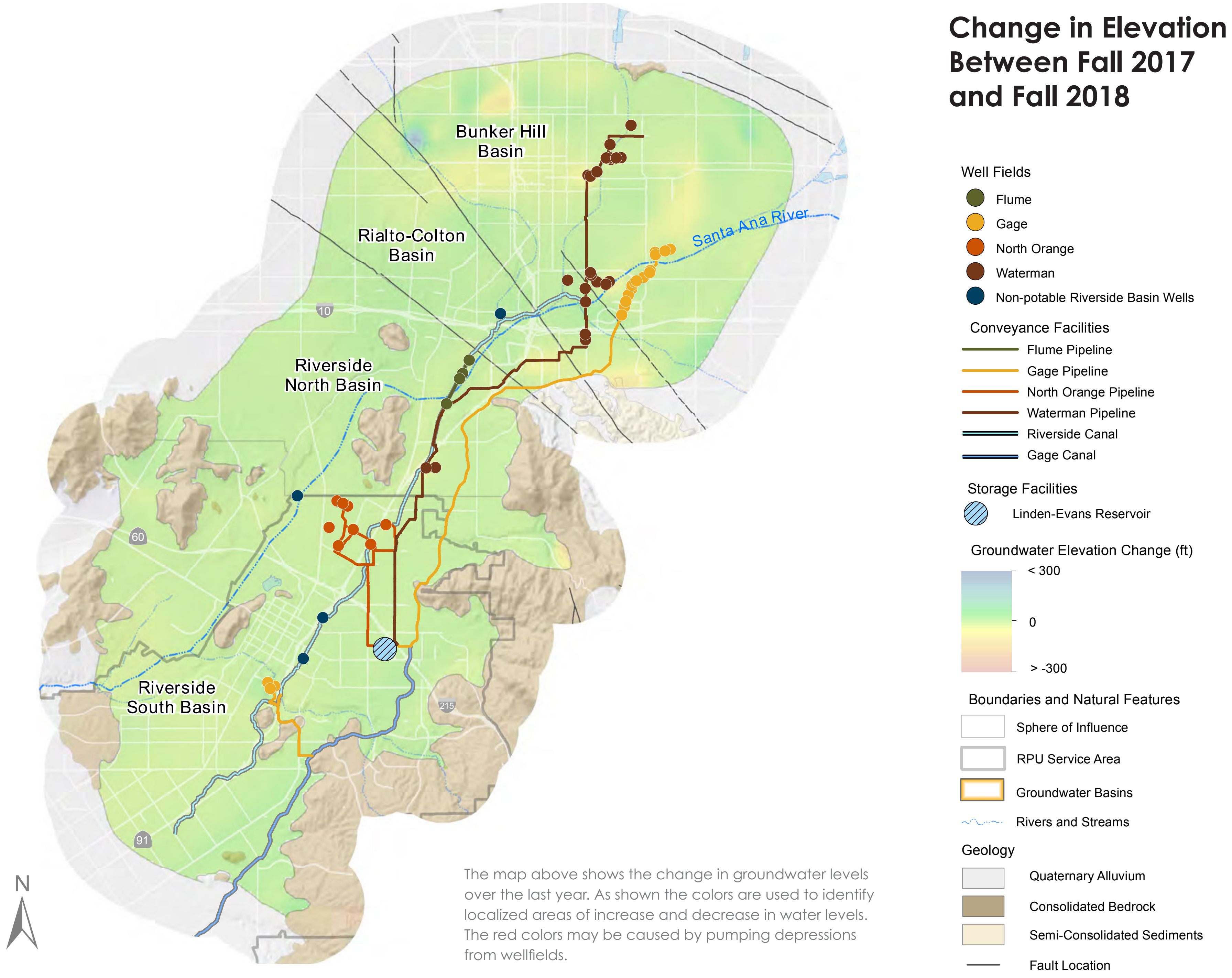


Fall 2017 Groundwater Elevations



Fall 2018 Groundwater Elevations

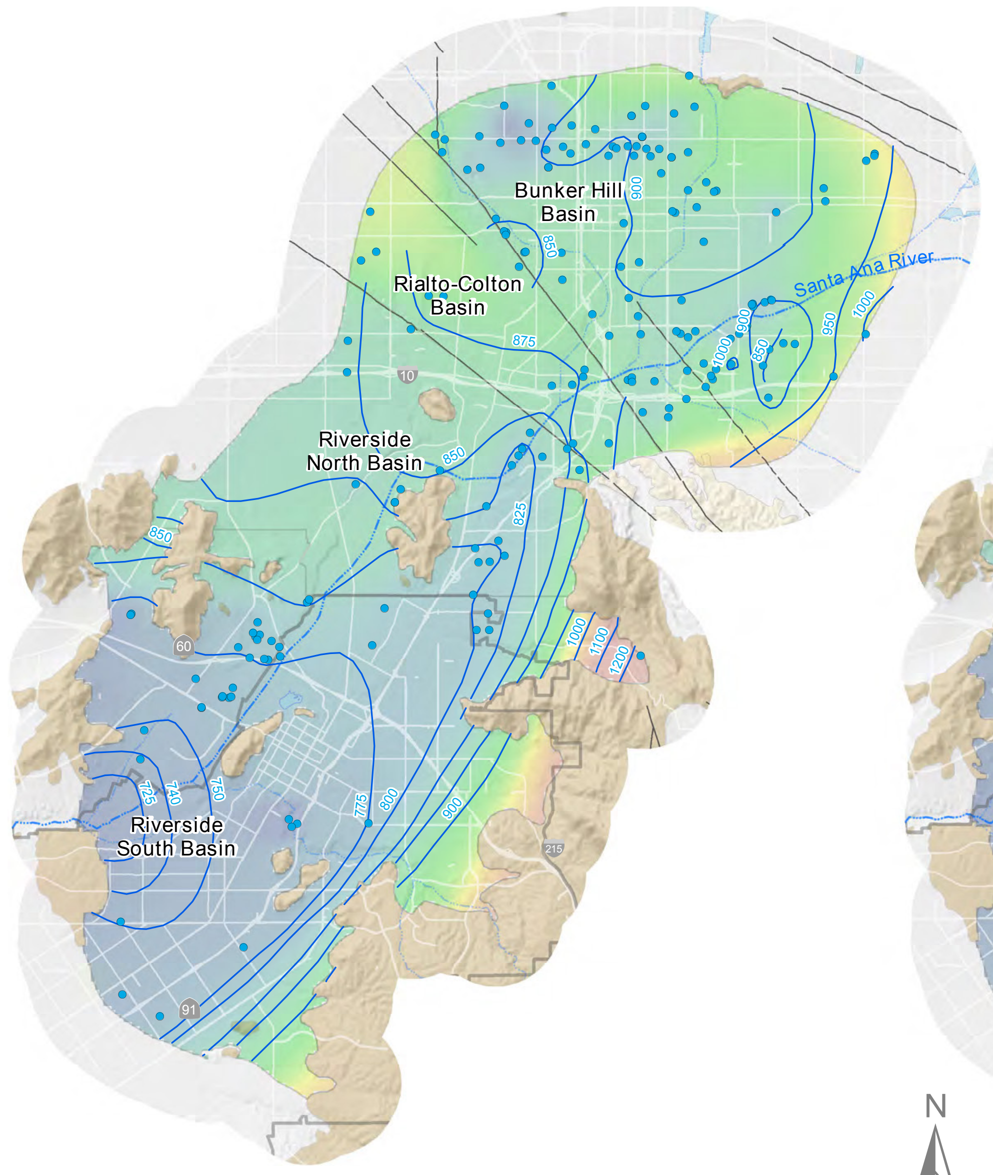
Change in Elevation Between Fall 2017 and Fall 2018



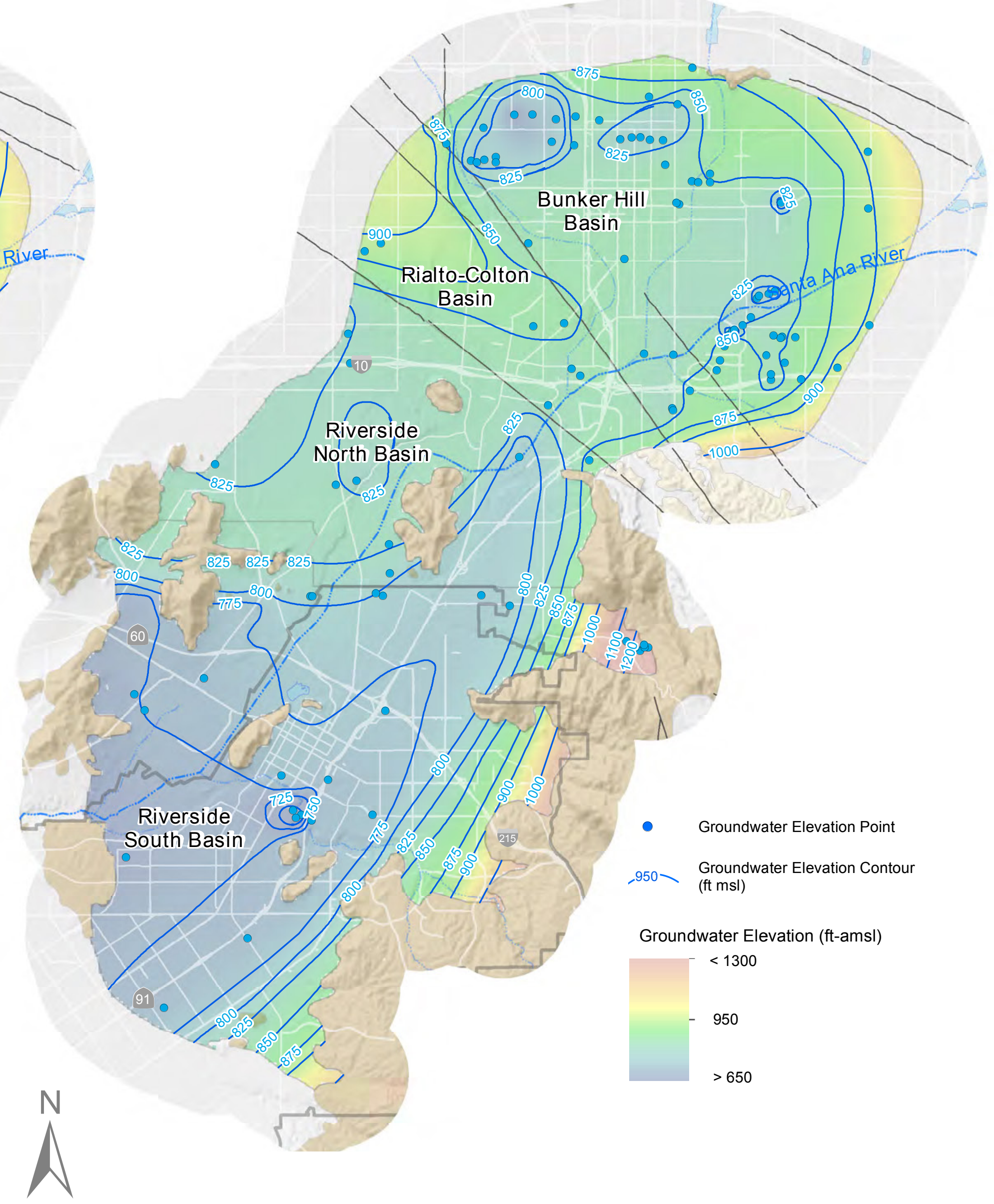
The map above shows the change in groundwater levels over the last year. As shown the colors are used to identify localized areas of increase and decrease in water levels. The red colors may be caused by pumping depressions from wellfields.

10-YEAR CHANGE

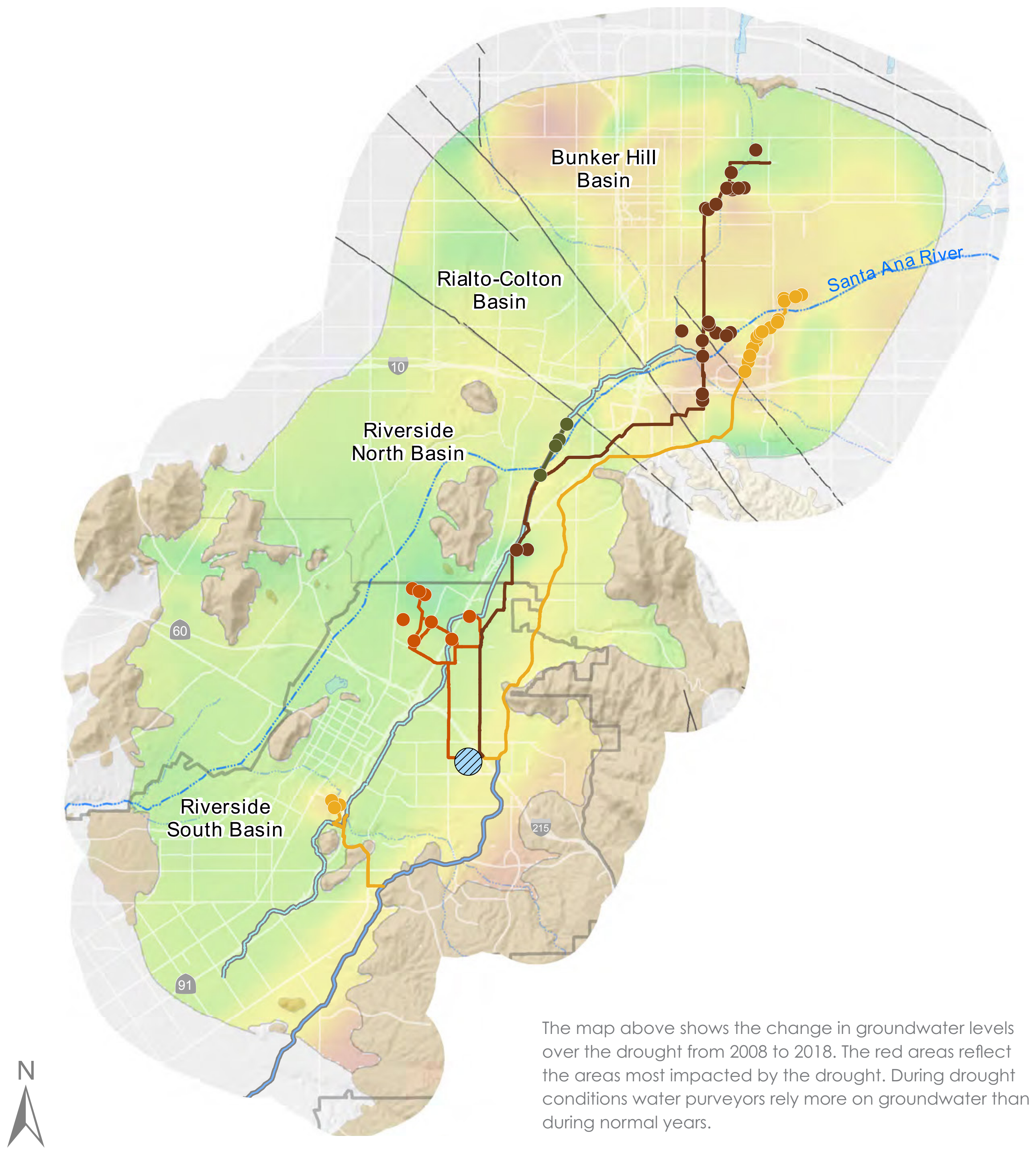
Groundwater level surfaces for Fall of 2008 and 2018 within portions of the basins are shown as contours in the two maps below. This 10-year period represents the most recent drought. RPU staff takes long term trends into account to proactively manage their groundwater facilities.



Fall 2008 Groundwater Elevations



Fall 2018 Groundwater Elevations



The map above shows the change in groundwater levels over the drought from 2008 to 2018. The red areas reflect the areas most impacted by the drought. During drought conditions water purveyors rely more on groundwater than during normal years.

Change in Elevation Between Fall 2008 and Fall 2018

Well Fields
- Flume
- Gage
- North Orange
- Waterman
- Non-potable Riverside Basin Wells

Conveyance Facilities
- Flume Pipeline
- Gage Pipeline
- North Orange Pipeline
- Waterman Pipeline
- Riverside Canal
- Gage Canal

Storage Facilities
- Linden-Evans Reservoir

Groundwater Elevation Change (ft)
- < 300
- 0
- > -300

Boundaries and Natural Features
- Sphere of Influence
- RPU Service Area
- Groundwater Basins
- Rivers and Streams

Geology
- Quaternary Alluvium
- Consolidated Bedrock
- Semi-Consolidated Sediments
- Fault Location

Seven Oaks Dam

6

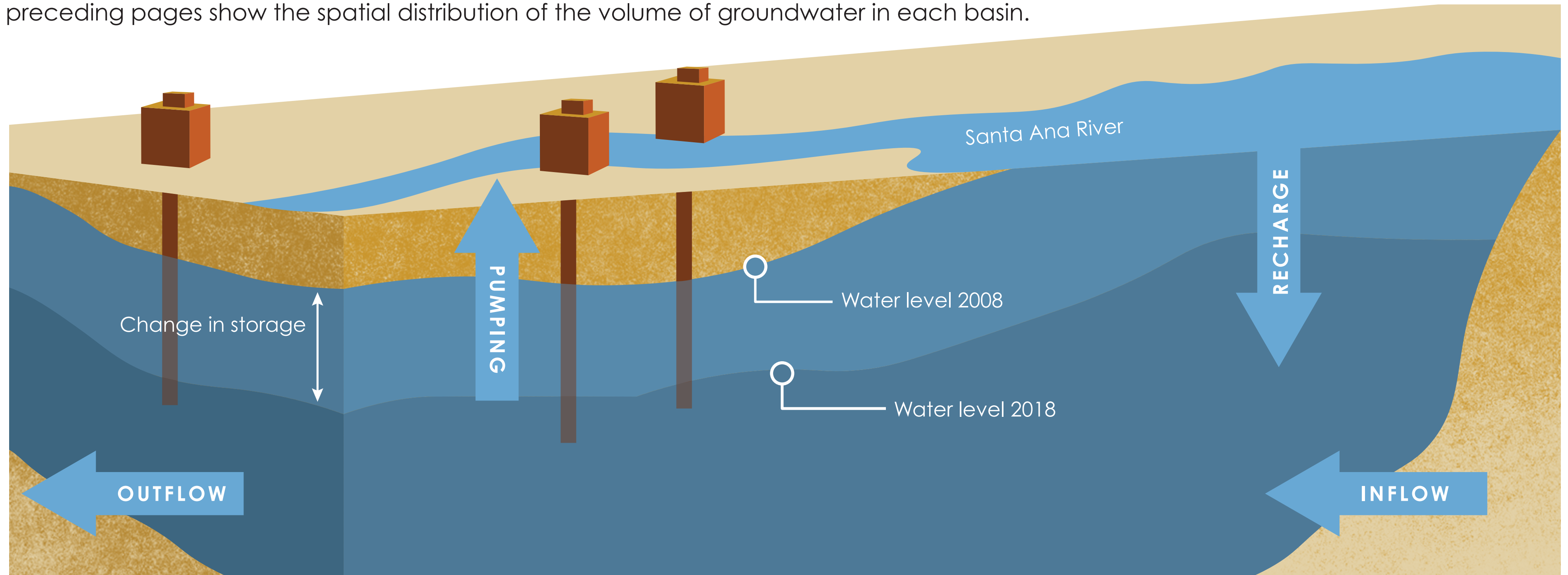
GROUNDWATER IN STORAGE

6 GROUNDWATER IN STORAGE

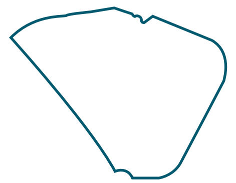
RPU tracks the quantity of groundwater in storage in each basin area as another tool to monitor groundwater conditions. Changes in storage can be used to better understand groundwater production and demands from each of RPU's wellfields distributed across the groundwater basins, and to make future decisions on where to replace and locate groundwater wells.

The change in storage over a time period is calculated by multiplying the change in groundwater level, by the specific yield of the aquifer materials over which the water-level change occurred, and by the area where the change occurred. The graphic below is a 3D representation of what a groundwater basin such as the Bunker Hill Basin may look like when comparing the change in storage that occurred over the 10-year period corresponding to the most recent drought. Water levels decreased possibly due to a combination of items such as urbanization, cultural conditions, changes in pumping patterns from other agencies, lower amounts of recharge, and less rainfall in general.

The volume of groundwater for each basin is summarized in the graphic to the right. The preceding pages show the spatial distribution of the volume of groundwater in each basin.



Summary of Groundwater in Storage by Basin within RPU's Sphere of Influence *(Acre-Feet)*



BUNKER HILL

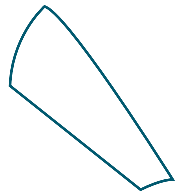
2008 Total Volume: 2,118,400

2017 Total Volume: 1,985,700

2018 Total Volume: 1,994,800

2017-2018 Volume Change: +9,100

2008 to 2018 Volume Change: -123,700



RIALTO-COLTON

2008 Total Volume: 485,300

2017 Total Volume: 473,400

2018 Total Volume: 472,800

2017-2018 Volume Change: -670

2008 to 2018 Volume Change: -12,500

RIVERSIDE NORTH

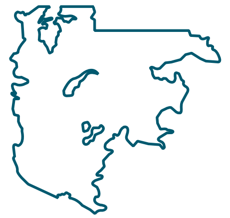
2008 Total Volume: 446,500

2017 Total Volume: 414,700

2018 Total Volume: 423,500

2017-2018 Volume Change: +8,800

2008 to 2018 Volume Change: -23,000



RIVERSIDE SOUTH

2008 Total Volume: 362,000

2017 Total Volume: 352,000

2018 Total Volume: 347,500

2017-2018 Volume Change: -4,500

2008 to 2018 Volume Change: -14,700

TOTAL VOLUME

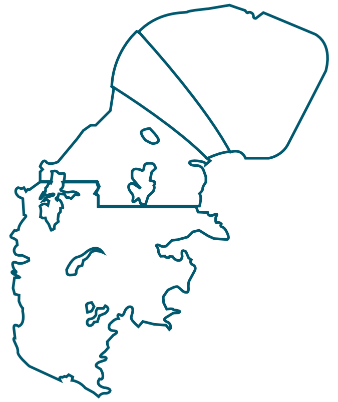
2008 Total Volume: 3,412,500

2017: 3,225,900

2018: 3,238,600

2017-2018 Change: +12,700

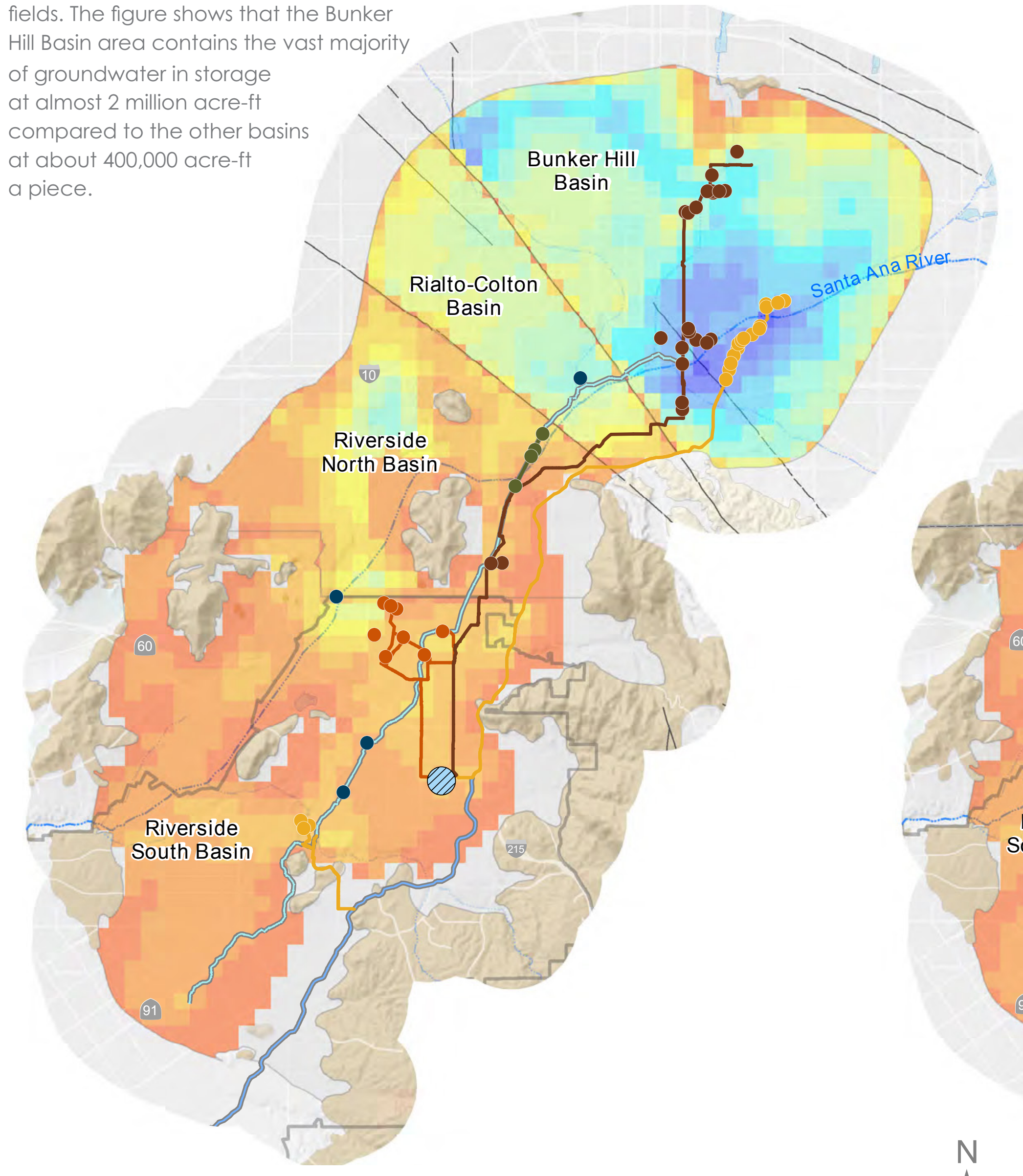
2008 to 2018 Volume Change: -173,900



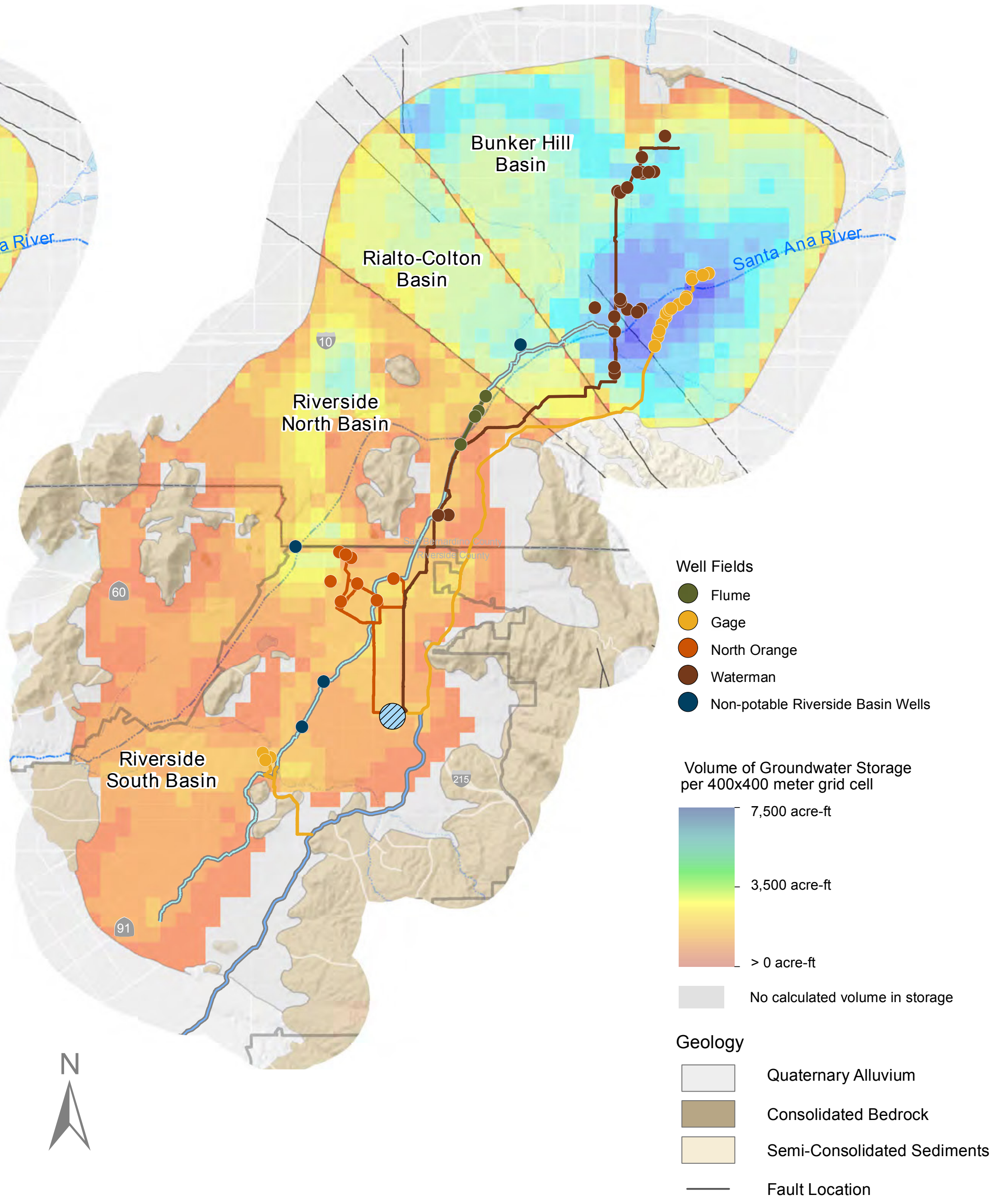
Note: The groundwater basin boundaries used in the storage calculations represent only a portion of each basin in the vicinity of RPU's well fields.

1-YEAR CHANGE

The maps shown below use the groundwater elevation maps in the prior section to estimate the volume of groundwater water in storage. RPU can use this information to manage the production from the well fields. The figure shows that the Bunker Hill Basin area contains the vast majority of groundwater in storage at almost 2 million acre-ft compared to the other basins at about 400,000 acre-ft a piece.

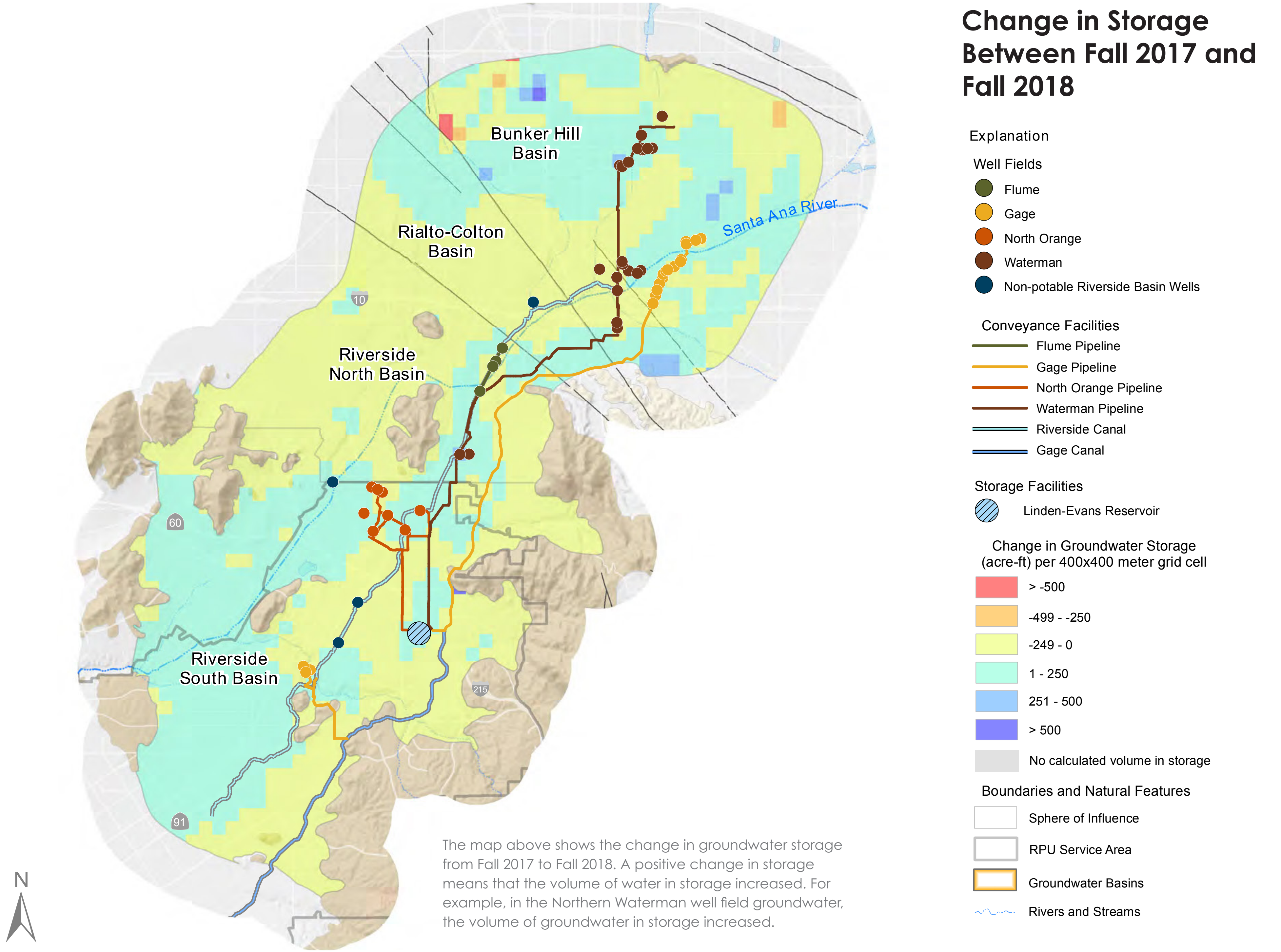


Fall 2017 Groundwater in Storage



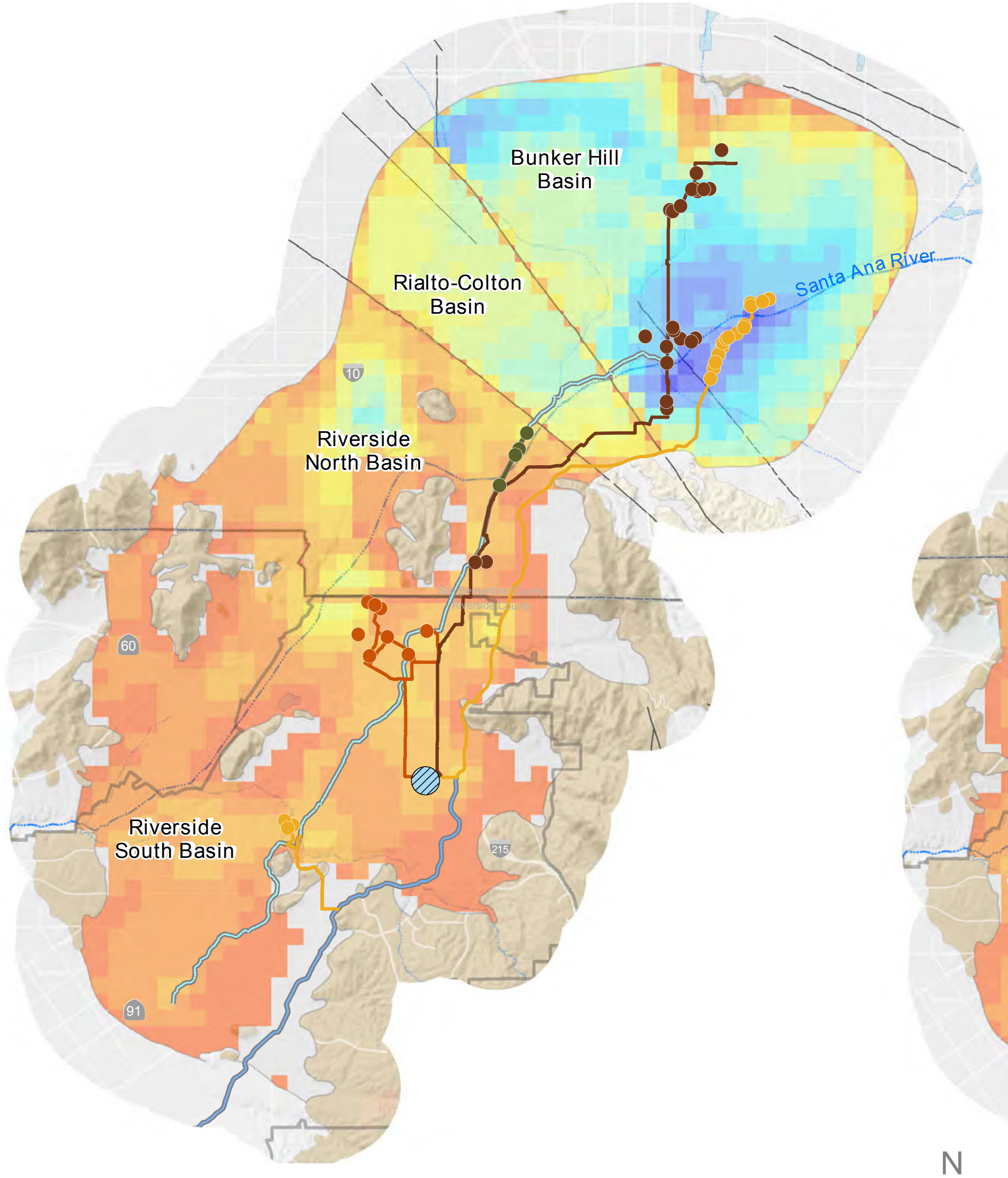
Fall 2018 Groundwater in Storage

Change in Storage Between Fall 2017 and Fall 2018

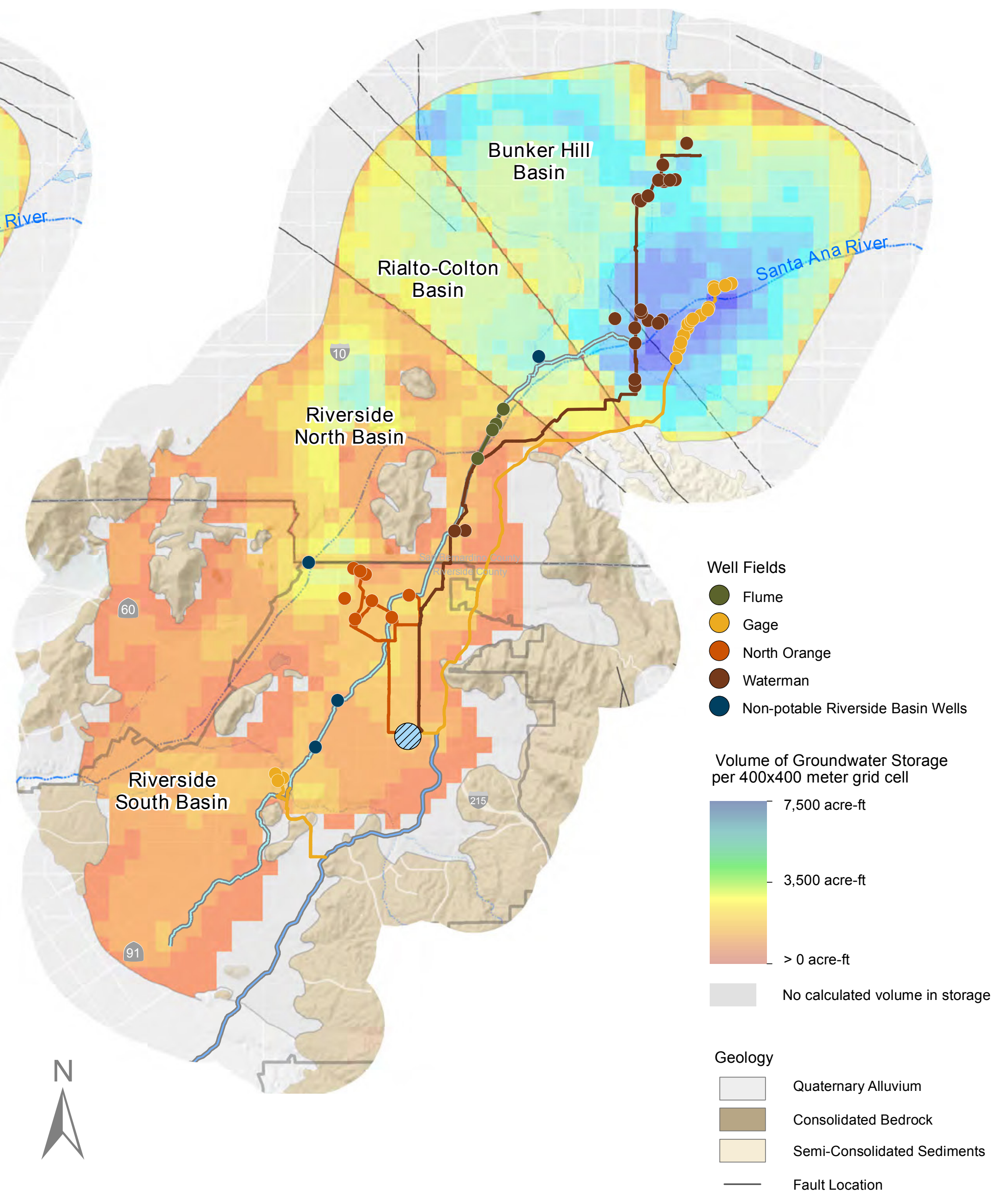


The map above shows the change in groundwater storage from Fall 2017 to Fall 2018. A positive change in storage means that the volume of water in storage increased. For example, in the Northern Waterman well field groundwater, the volume of groundwater in storage increased.

The maps shown below are used to show the effects of the drought from 2008 to 2018.

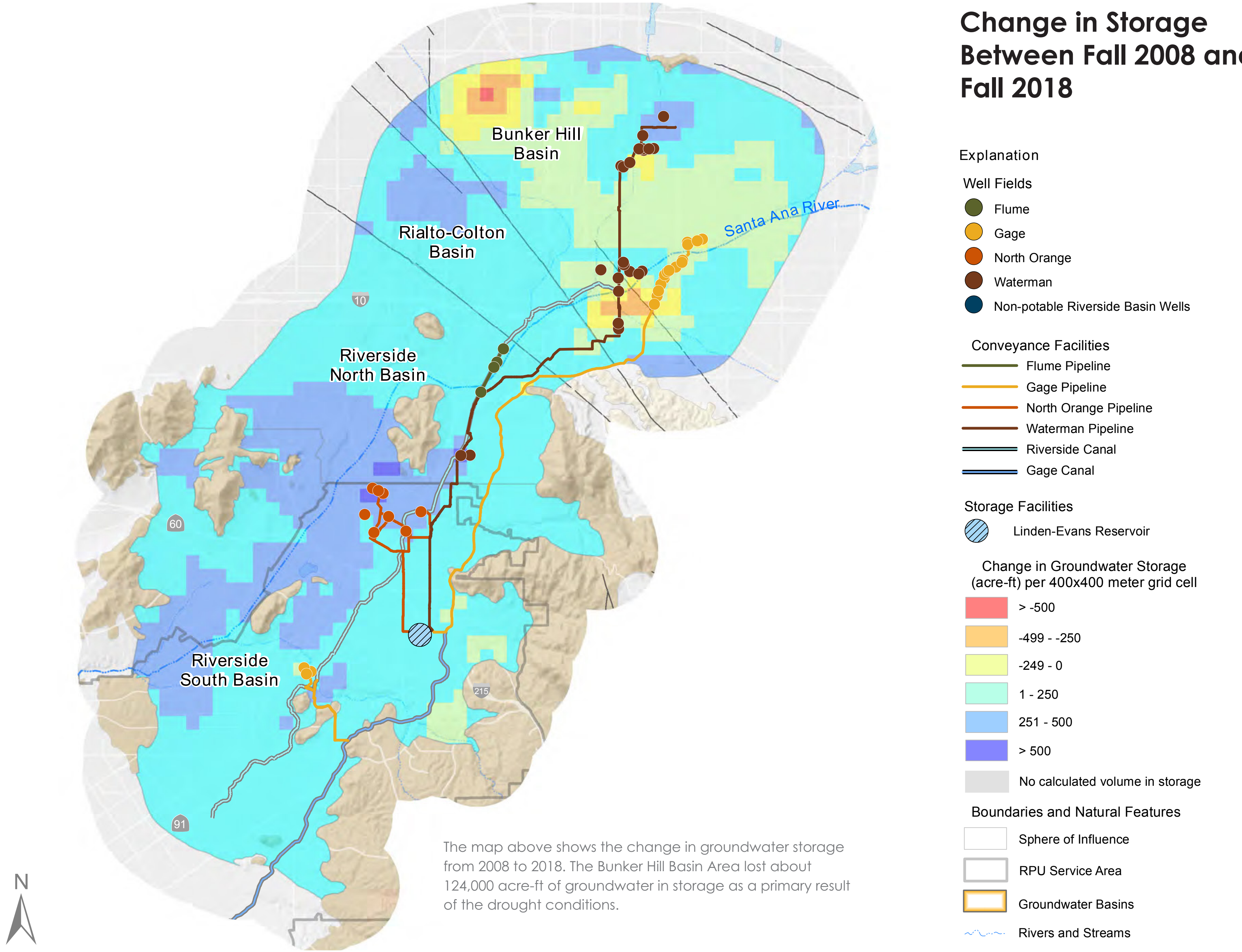


Fall 2008 Groundwater in Storage



Fall 2018 Groundwater in Storage

Change in Storage Between Fall 2008 and Fall 2018



The map above shows the change in groundwater storage from 2008 to 2018. The Bunker Hill Basin Area lost about 124,000 acre-ft of groundwater in storage as a primary result of the drought conditions.

North Orange GAC Treatment Plant

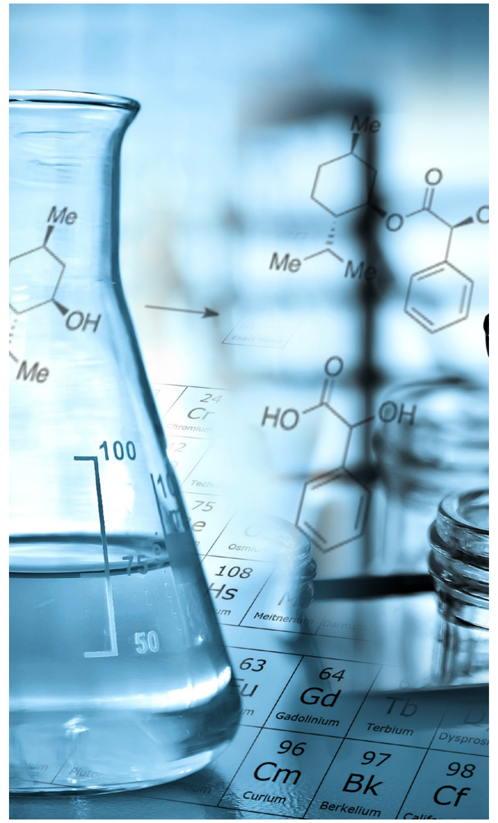
7

GROUNDWATER QUALITY

7 GROUNDWATER QUALITY

Most groundwater produced throughout the southern and inland California region requires treatment. RPU continuously monitors the water quality of its drinking water wells to ensure the water it serves meets both federal and state drinking water standards. This proactive approach allows RPU to quickly identify changes in groundwater quality conditions so we may pursue additional investigations, communicate with stakeholders, and take remedial action if necessary.

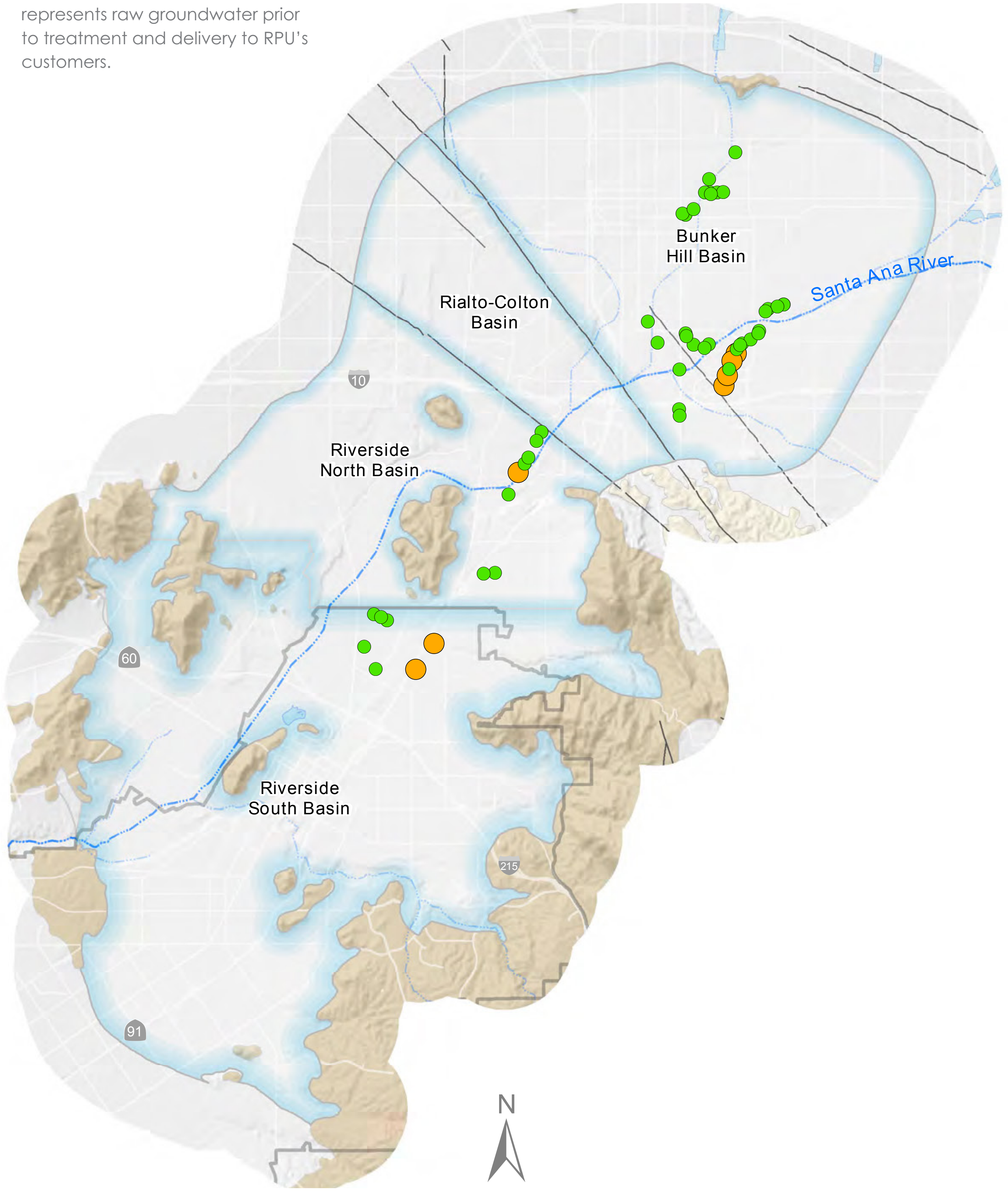
The Safe Drinking Water Act was originally passed by Congress in 1974 to protect public health by regulating public drinking water supplies. Since then, additional amendments and measures have been implemented by Federal and State Officials to ensure public water supply systems deliver safe and reliable drinking water for public consumption. Historical waste disposal practices and chemical application of now-banned chemicals that were once legally and regularly used, have created localized contaminant plumes that have impacted the region's groundwater basins and at times, the City's supply. The City of Riverside has actively litigated against known entities that have impacted Riverside's groundwater supplies and has successfully obtained funding for construction and maintenance of facilities used to remove the constituents of concern from its groundwater supply. RPU has developed mutually beneficial relationships with some of the known entities to work collaboratively to intentionally capture a plume with select wells to limit the spread of the plume and protect downstream wells, and to provide treatment at the capture wells to remove the constituents of concern. Extensive monitoring occurs in areas of known plumes to ensure plume containment is always maintained. In addition, RPU strategically locates and constructs new wells to extract water from deeper, cleaner zones within the groundwater basin. The following figures depict some of the constituents RPU closely tracks.



2018 RPU Groundwater Sampling

52 wells sampled	**150+** constituents	**492** water quality samples

The data shown in the figure below represents raw groundwater prior to treatment and delivery to RPU's customers.



Total Dissolved Solids

Max = 650 mg/L

Mean = 400 mg/L

Above MCL = 2 wells

RPU Production Wells
Total Dissolved Solids (TDS; mg/L)

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Secondary US EPA MCL = 500 mg/L

Boundaries and Natural Features

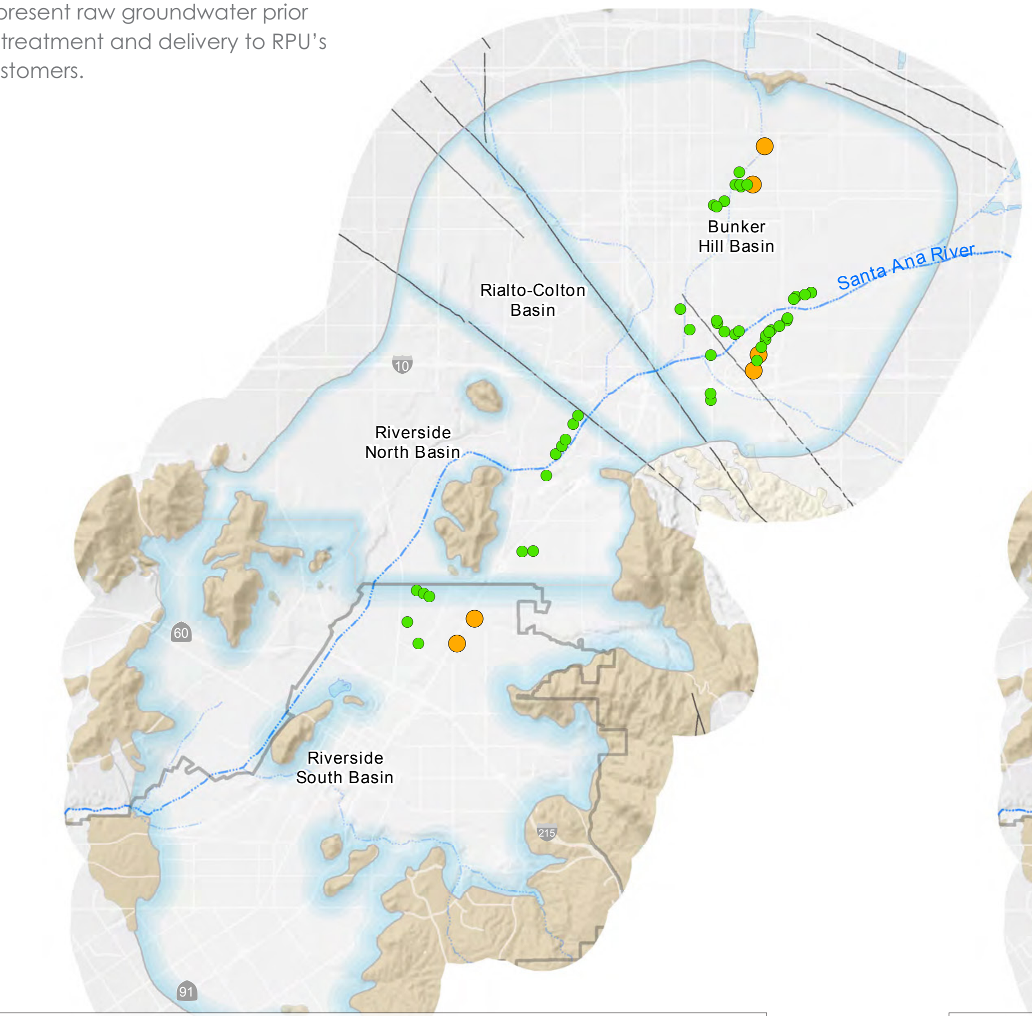
- Sphere of Influence
- RPU Service Area
- Groundwater Basins
- Rivers and Streams

Geology

- Quaternary Alluvium
- Consolidated Bedrock
- Semi-Consolidated Sediments
- Fault Location

Common sources for TDS: Soil Runoff

The data shown in the figures below represent raw groundwater prior to treatment and delivery to RPU's customers.



Nitrate-Nitrogen

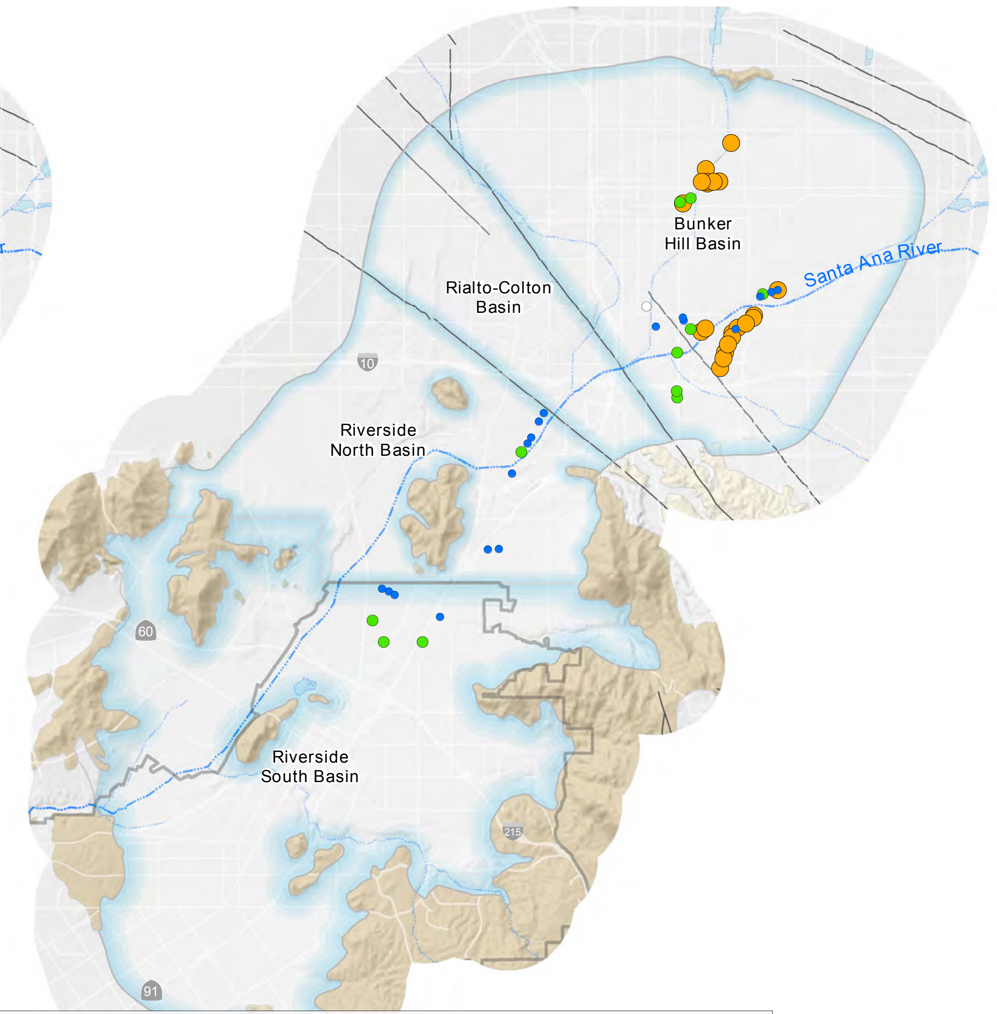
Max = 12 mg/L

Above MCL = 5 wells

Common Sources: Fertilizers, septic tank sewage; erosion of natural deposits.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Primary US EPA MCL = 10 mg/L
Primary CA MCL = 10 mg/L



Perchlorate

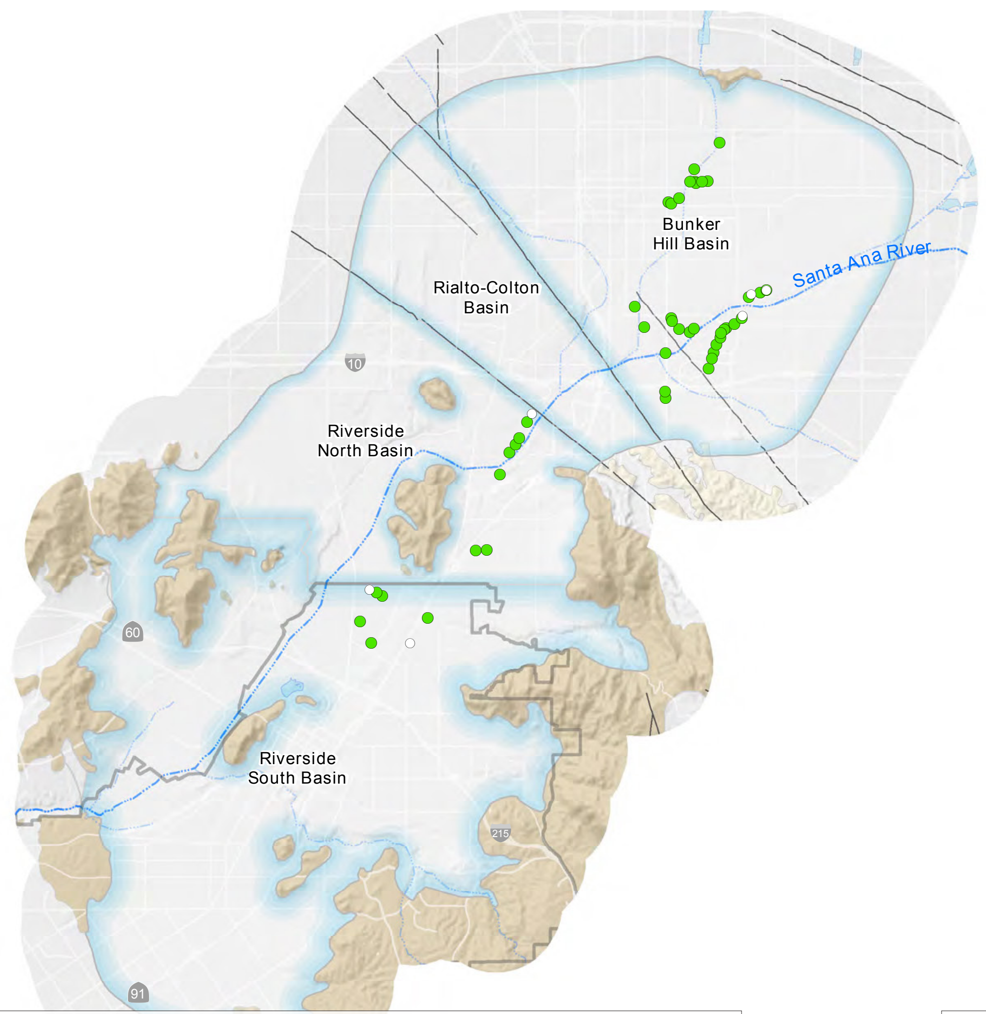
Max = 43 ug/L

Above MCL = 17 wells

Common Sources: Solid rocket propellant, aerospace operations, fireworks, explosives, flares, matches.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Primary CA MCL = 6 ug/L



Chromium

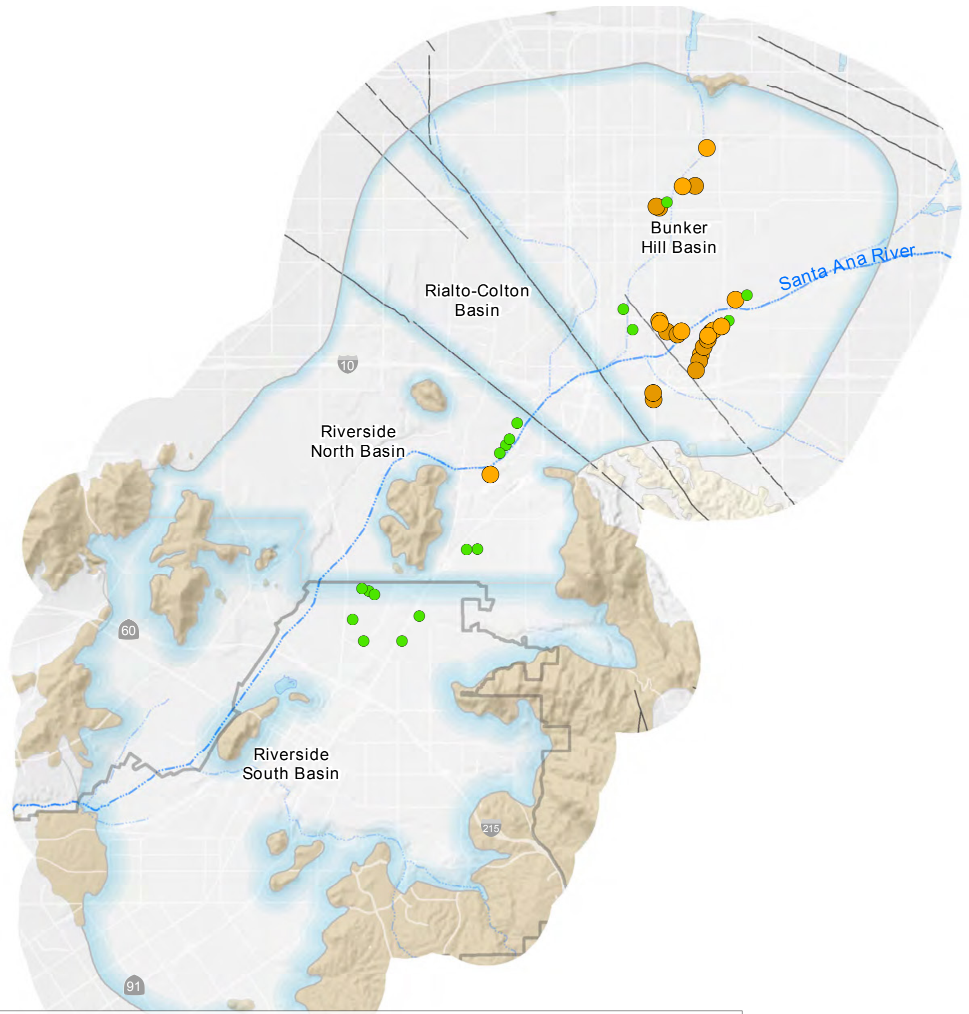
Max = 6.3 ug/L

Above MCL = 0 wells

Common Sources: Steel and pulp mills, chrome plating; erosion of natural deposits.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Primary US EPA MCL = 100 ug/L
Primary CA MCL = 50 ug/L



Hexavalent and Dissolved Hexavalent Chromium

Max = 4.1 ug/L

Common Sources: Steel and pulp mills, chrome plating; erosion of natural deposits.

- Not Detected
- < PHG
- > PHG
- > 2 ug/L

Currently there is no US or CA EPA MCL
CA Public Health Goal = 0.02 ug/L

Boundaries and Natural Features

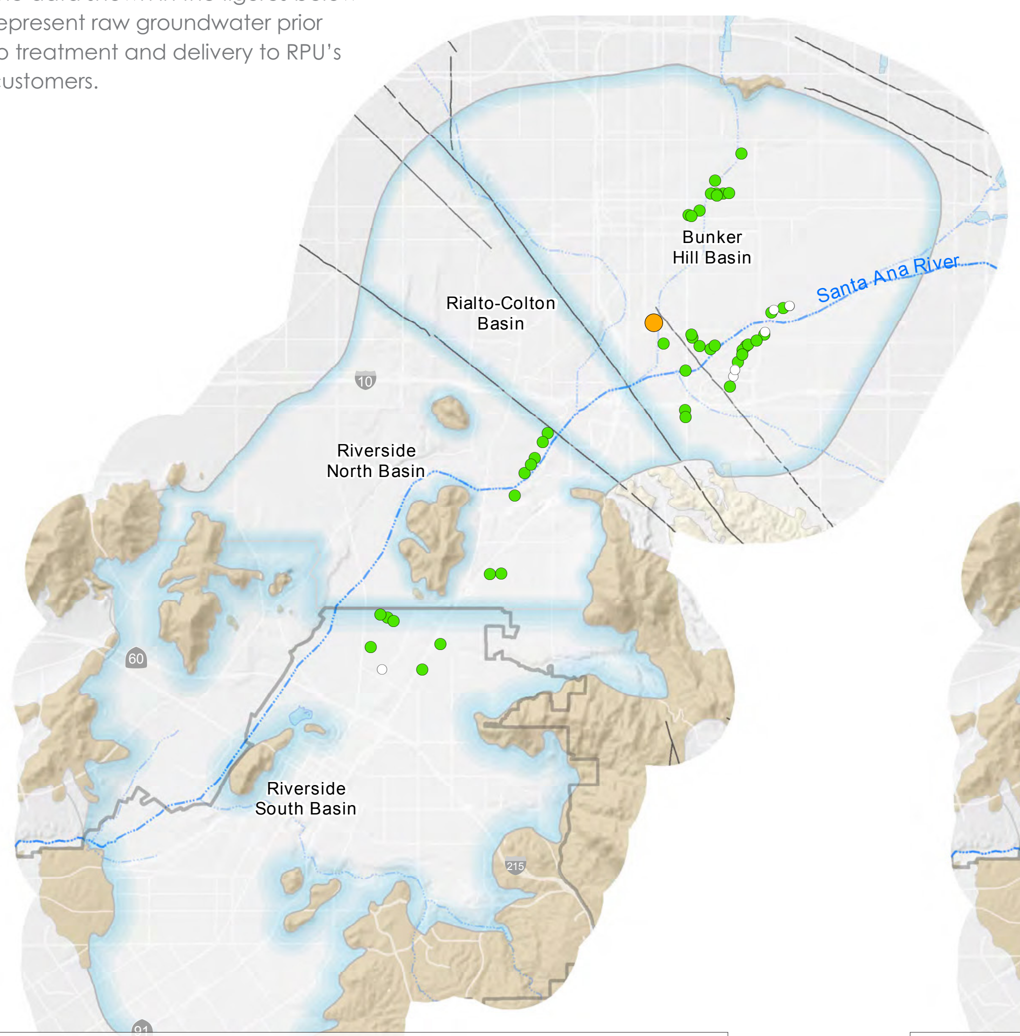
- Sphere of Influence
- RPU Service Area
- Groundwater Basins
- Rivers and Streams

Geology

- Quaternary Alluvium
- Consolidated Bedrock
- Semi-Consolidated Sediments
- Fault Location

N

The data shown in the figures below represent raw groundwater prior to treatment and delivery to RPU's customers.



Arsenic

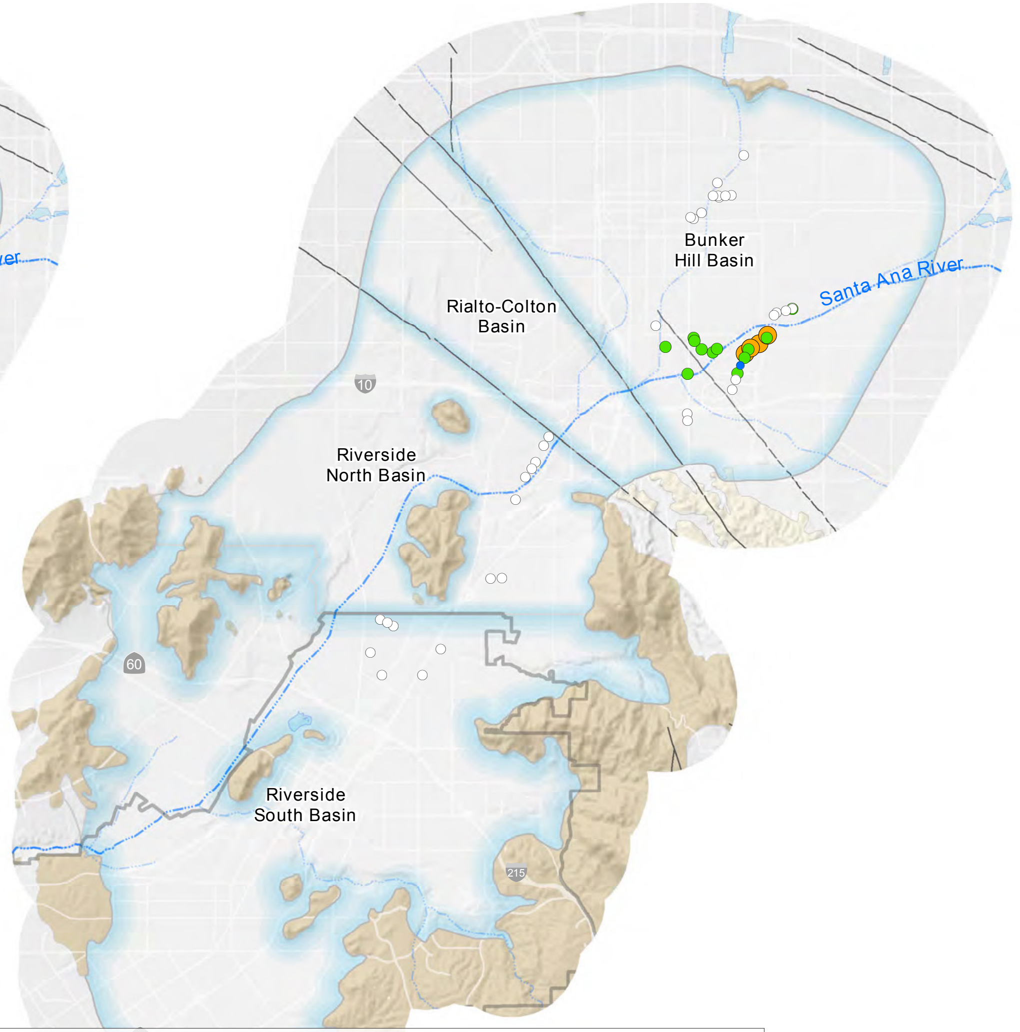
Max = 7.7 ug/L

Above MCL = 1 wells

Common Sources: Erosion of natural deposits; runoff from orchards; glass, electronics production wastes.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Primary US EPA MCL = 10 ug/L
Primary CA MCL = 10 ug/L



TRICHOLOROTHENE (TCE)

Max = 11 ug/L

Above MCL = 2 wells

Common Sources: Discharges from industrial and chemical factories; biodegradation byproducts, discharges from metal degreasing sites.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Primary US EPA MCL = 5 ug/L
Primary CA MCL = 5 ug/L

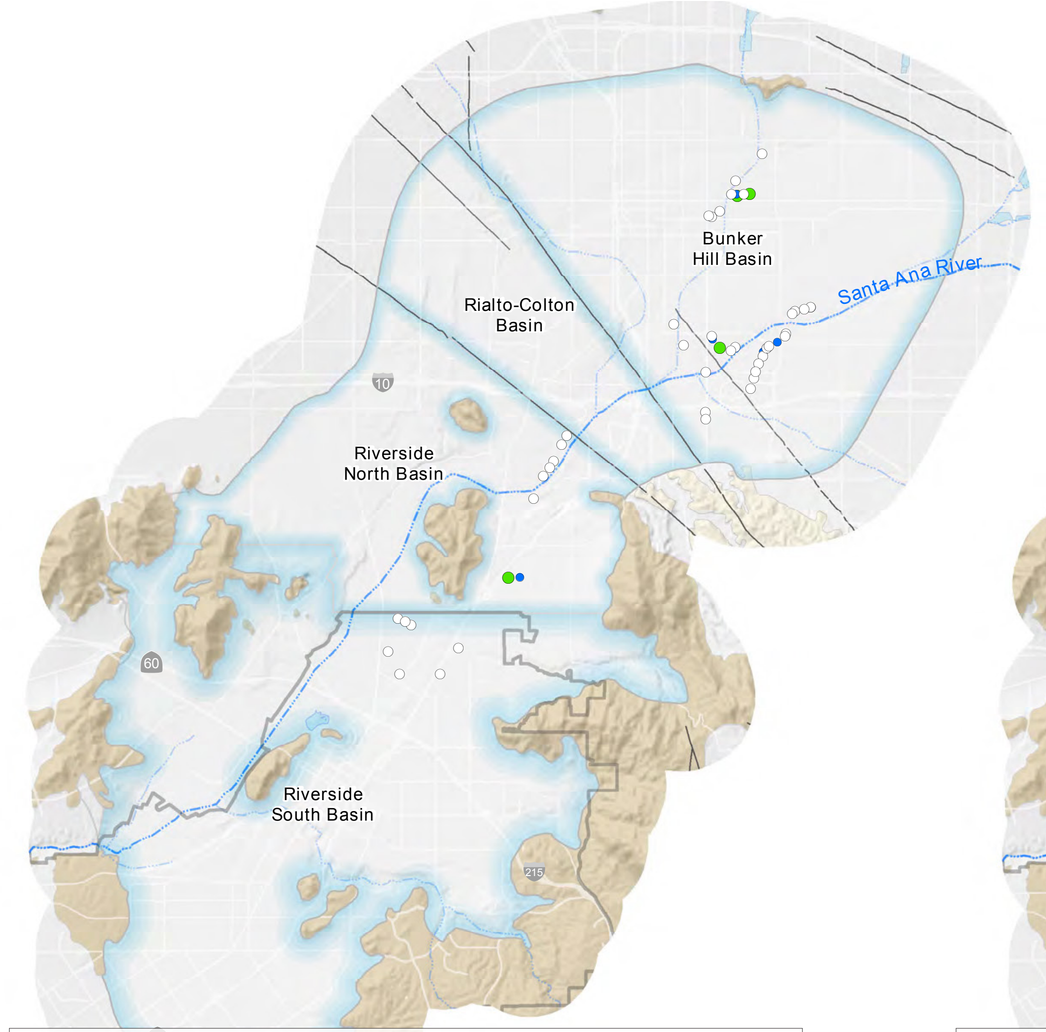
Boundaries and Natural Features

- Sphere of Influence
- RPU Service Area
- Groundwater Basins
- Rivers and Streams

Geology

- Quaternary Alluvium
- Consolidated Bedrock
- Semi-Consolidated Sediments
- Fault Location

N



TETRACHLOROETHYLENE (PCE)

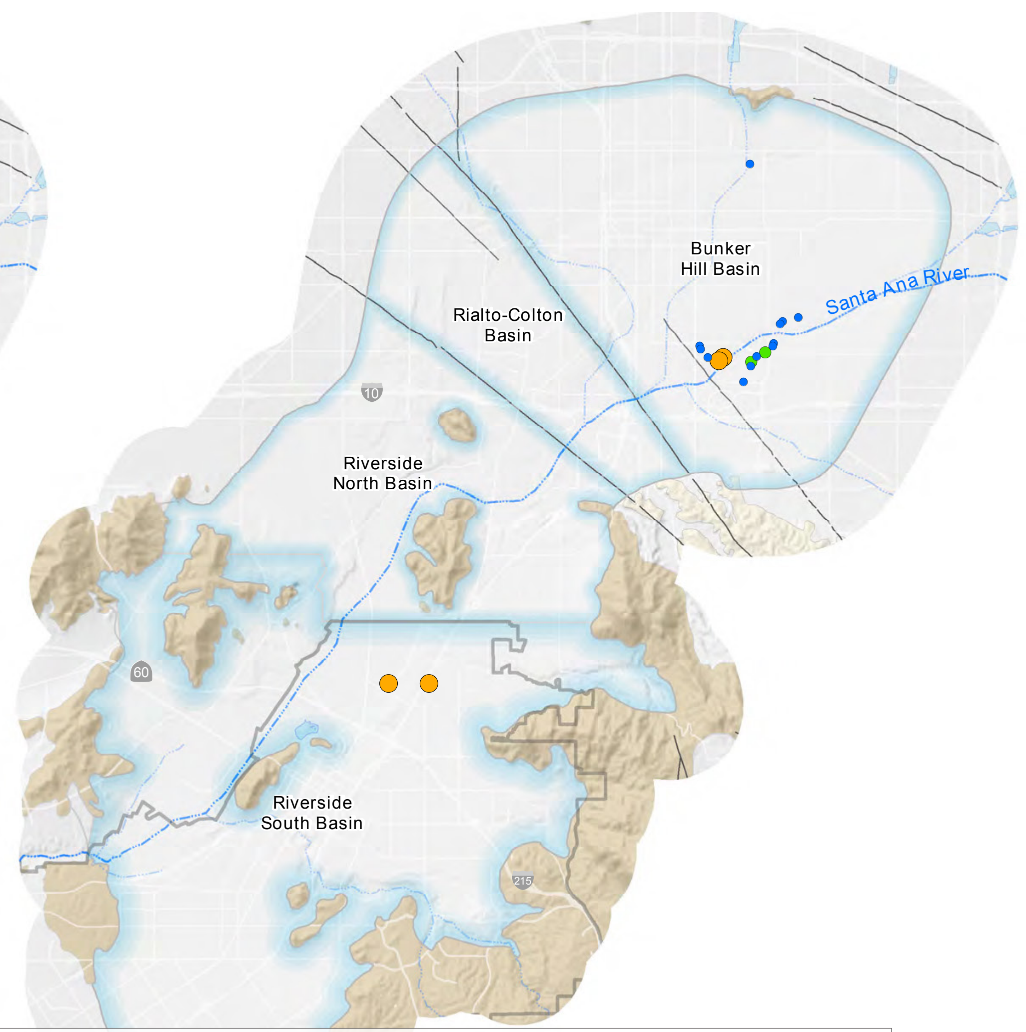
Max = 0.39 ug/L

Above MCL = 0 wells

Common Sources: Discharge from factories, dry cleaners, metal degreasers.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < MCL
- > MCL

Primary US EPA MCL = 5 ug/L
Primary CA MCLl = 5 ug/L



1,2,3,-TRICHLOROPROPANE (1,2,3-TCP)

Max = 0.05 ug/L

Above MCL = 4 wells

Common Sources: Industrial and agricultural chemicals, leach wastes, cleaning solvents, paints, varnish remover, and pesticides.

- Not Detected
- < Detection Level Reporting (DLR)
- > DLR and < PHG
- > PHG

CA Notification Level = 0.005 ug/L
Primary CA PHG = 0.007 ug/L

Riverside North Treatment Plant

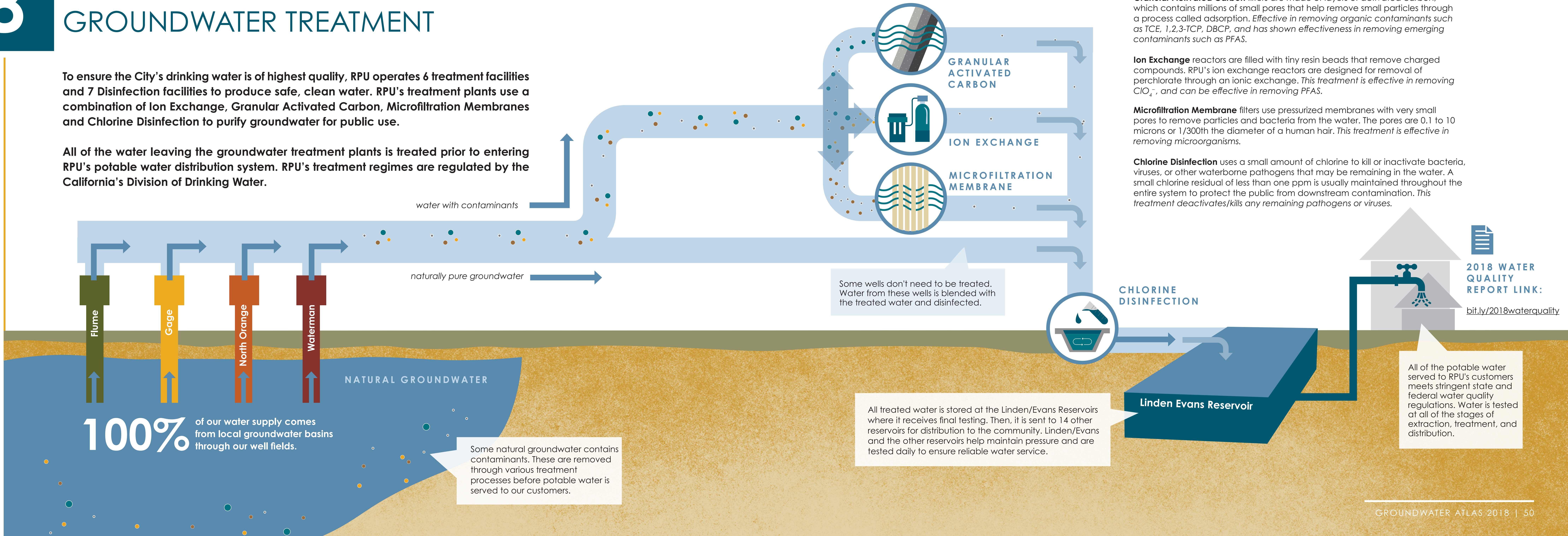
8

GROUNDWATER TREATMENT

8 GROUNDWATER TREATMENT

To ensure the City's drinking water is of highest quality, RPU operates 6 treatment facilities and 7 Disinfection facilities to produce safe, clean water. RPU's treatment plants use a combination of Ion Exchange, Granular Activated Carbon, Microfiltration Membranes and Chlorine Disinfection to purify groundwater for public use.

All of the water leaving the groundwater treatment plants is treated prior to entering RPU's potable water distribution system. RPU's treatment regimes are regulated by the California's Division of Drinking Water.



GROUNDWATER TREATMENT

Granular Activated Carbon filters are made of layers of activated carbon, which contains millions of small pores that help remove small particles through a process called adsorption. *Effective in removing organic contaminants such as TCE, 1,2,3-TCP, DBCP, and has shown effectiveness in removing emerging contaminants such as PFAS.*

Ion Exchange reactors are filled with tiny resin beads that remove charged compounds. RPU's ion exchange reactors are designed for removal of perchlorate through an ionic exchange. *This treatment is effective in removing ClO_4^-, and can be effective in removing PFAS.*

Microfiltration Membrane filters use pressurized membranes with very small pores to remove particles and bacteria from the water. The pores are 0.1 to 10 microns or 1/300th the diameter of a human hair. *This treatment is effective in removing microorganisms.*

Chlorine Disinfection uses a small amount of chlorine to kill or inactivate bacteria, viruses, or other waterborne pathogens that may be remaining in the water. A small chlorine residual of less than one ppm is usually maintained throughout the entire system to protect the public from downstream contamination. *This treatment deactivates/kills any remaining pathogens or viruses.*

ACKNOWLEDGMENTS

Riverside Public Utilities Board of Directors:

- David M. Crohn (Board Chair), Ward 1
- Ana Miramontes, Ward 2
- Elizabeth Sanchez-Monville (Board Vice-Chair), Ward 3
- David Austin, Ward 4
- Andrew Walcker, Ward 5
- Jeanette Hernandez, Ward 6
- Gil Oceguera, Ward 7
- Jo Lynne Russo-Pereyra, Citywide
- Peter Wohlgemuth, Citywide

Riverside Public Utilities Executives:

- Todd M. Corbin, General Manager
- Daniel E. Garcia, Deputy General Manager
- Todd Jorgenson, Assistant General Manager | Water
- George Hanson, Assistant General Manager | Energy Delivery

WATER | ENERGY | LIFE
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www.riversideca.gov/utilities

WSC Water Systems Consulting, Inc.
www.expectwsc.com

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