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COACHELLA VALLEY WATER DISTRICT ENGINEER'S REPORT ON WATER SUPPLY AND REPLENISHMENT ASSESSMENT FOR THE EAST WHITEWATER RIVER SUBBASIN AREA OF BENEFIT 2015/2016

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Coachella Valley Water District .... CVWD
Desert Water Agency .... DWA
State Water Project .... SWP
Area of Benefit .... AOB
Groundwater Replenishment Program .... GRP
Acre-Feet .... AF
Acre-Feet per Year .... AF/Yr
Metropolitan Water District of Southern California .... MWD
California Department of Water Resources .... CDWR
Replenishment Assessment Charge .... RAC
Coachella Branch of the All American Canal .... Coachella Canal or Canal
State of California .... State
Water Reclamation Plant .... WRP
Thomas E. Levy Groundwater Replenishment Facility .... TEL Replenishment Facility
Coachella Valley Water Management Plan .... CVWMP
2014 Status Report for the
2010 Coachella Valley Water Management Plan Update .... 2014 Status Report
United States Geological Survey .... USGS
Million Gallons per Day .... MGD
Rosedale Rio Bravo Water Storage District .... Rosedale
Fiscal Year .... FY

CHAPTER I
EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Coachella Valley Water District (CVWD) and Desert Water Agency (DWA) have been importing Colorado River water exchanged for State Water Project (SWP) water allocations to replenish the groundwater within the Coachella Valley Groundwater Basin since 1973. Groundwater replenishment within the East Whitewater River Subbasin began in 1997 through a pilot program at the Thomas E. Levy Groundwater Replenishment Facility (TEL Replenishment Facility). In 2004, the Martinez Canyon pilot project was brought online.

If groundwater replenishment with imported water is eliminated, groundwater overdraft will result. Increased overdraft results in declining water levels, increased pump lifts, and increased energy consumption to pump groundwater for irrigation and domestic use. Extreme overdraft has the potential to cause ground surface subsidence and to impact water quality and groundwater storage volume.

CVWD's East Whitewater River Subbasin Groundwater Replenishment Program (GRP) Area of Benefit (AOB) is illustrated in **Figures 2 and 3**. The costs of CVWD's GRP are recovered through the Replenishment Assessments Charge (RAC) applied to all non-exempted groundwater production within the AOB. Producers extracting groundwater from the East Whitewater River Subbasin at rates of 25 acre feet per year (AF/Yr) or less are specifically exempted from the GRP and RAC.

Due to implementation of projects identified in the 2010 Coachella Valley Water Management Plan, average groundwater levels in the East Whitewater River Subbasin AOB are increasing. **Figure 5** illustrates total inflow to the subbasin exceeds total outflow, and the subbasin continues to experience a positive change in groundwater in storage. However, continued artificial replenishment is necessary to prevent overdraft in the future.

The replenishment fund for the AOB is underfunded and the RAC revenue is currently insufficient for the expenses associated with the GRP.

CVWD proposes to levy the RAC up to $59/AF for (based on Proposition 218 proceedings), effective July 1, 2015. Based on the recommended RAC rate and the projected revenue as shown in **Table 5**, the proposed RAC increase results in a projected decrease in Cash Flow in fiscal year 2016 in the amount of $5.6 million.

CHAPTER II
INTRODUCTION

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INTRODUCTION

This is the twelfth annual Engineer's Report on Water Supply and Replenishment Assessment for the East Whitewater River Subbasin Area of Benefit (AOB) (formerly known as the Lower Whitewater River Subbasin AOB) managed by Coachella Valley Water District (CVWD). This program began in the 2004-2005 fiscal year and has replenished the east portion of the Whitewater River Subbasin with a cumulative total of approximately 234,027 acre feet (AF) of imported water.

CVWD serves an area of approximately 1,000 square miles in the Coachella Valley within the Riverside, Imperial, and San Diego Counties. The Coachella Valley is situated in the northwesterly portion of California's Colorado Desert. The Coachella Valley is bordered on the west and north by high mountains, which provide an effective barrier against coastal storms, and which greatly reduce the contribution of direct precipitation to replenish the Coachella Valley's groundwater basin. The bulk of natural groundwater replenishment comes from runoff from the adjacent mountains.

The need to enhance the Coachella Valley's water supply has been recognized for many years. The formation of CVWD in 1918 was a direct result of the concern of residents over a plan to export water from the Whitewater River to the Imperial Valley. Early residents of the Coachella Valley also recognized action was needed to stem the decline of the water table, resulting from their groundwater extractions. Their concern led CVWD to enter into an agreement for construction of the Coachella Branch of the All American Canal (Coachella Canal or Canal) to bring Colorado River water to the Coachella Valley. Since 1949, the Coachella Canal has been providing water for irrigation use in the eastern Coachella Valley.

After establishing a supplemental water importation program in the eastern part of the Coachella Valley and with the onset of recreational development in the western part of the Coachella Valley, the need for a supplemental water importation program in the northwestern part of the Valley was recognized. As a result, CVWD and the Desert Water Agency (DWA) entered into separate contracts with the State of California (State) to purchase water from the State Water Project (SWP). A direct connection from the SWP to the Coachella Valley does not currently exist. Therefore, CVWD and DWA entered into an agreement with the Metropolitan Water District of Southern California (MWD) to exchange water from MWD's Colorado River Aqueduct, which crosses the western portion of the Coachella Valley near Whitewater, for CVWD and DWA allocations of SWP water. Since 1973, CVWD and DWA have been releasing Colorado River exchanges near Whitewater to replenish groundwater in the west portion of the Whitewater River Subbasin of the Coachella Valley.

In 1967, CVWD entered the water reclamation field, having identified reclaimed water as an alternative source of water that could allow groundwater to remain in storage and help to reduce overdraft. Today, CVWD operates six water reclamation plants (WRPs) in the Coachella Valley. Recycled water from three of these facilities (WRP 7, 9, and 10) has been used for golf course and greenbelt irrigation for many years, thereby reducing demand on the groundwater basin. CVWD is planning to continue expanding recycled water use throughout the mid-valley.

In the east portion of the Whitewater River Subbasin, groundwater levels had been declining since 1980. In response, CVWD implemented a Groundwater Replenishment Plan (GRP) to replenish the Subbasin at two sites in the eastern Coachella Valley. Groundwater replenishment began in 1997 using pilot groundwater replenishment facilities.

The Dike 4 pilot project began in 1997, and became the fully operational Thomas E. Levy Groundwater Replenishment Facility (TEL Replenishment Facility) in June 2009, with a full-scale capacity of 40,000 acre feet per year (AF/Yr). The Martinez Canyon pilot project, designed for 4,000 AF/Yr, began in 2004 to determine if water conditions at the site were beneficial for groundwater replenishment. Although there were zero deliveries to the Martinez Canyon replenishment facilities, CVWD continues to monitor and evaluate the need and feasibility of replenishment in the Martinez Canyon alluvial fan. As of the end of 2014, the combined cumulative total replenishment at the two sites was 234,027 AF.

In 2002 the CVWD Board of Directors adopted the Coachella Valley Water Management Plan (CVWMP). The CVWMP was updated in 2010. The goal of the 2010 CVWMP Update is to reliably meet current and future water demands in a cost effective and sustainable manner through water conservation, increased surface water supplies, substitution of surface water supplies for groundwater (source substitution), groundwater replenishment, and monitoring. The 2010 CVWMP Update can be found on CVWD's website at www.cvwd.org.

The State Water Code requires completion of an Engineer's Report regarding the GRP before CVWD can levy and collect groundwater replenishment assessment charge (RAC). The report must include the condition of groundwater supplies, the need for groundwater replenishment, the AOB boundary, water production within the AOB, and RACs to be levied upon water production in the AOB. It must also contain recommendations regarding the GRP including the source and amount of replenishment water and related costs. The first Engineer's Report for the East Whitewater River Subbasin AOB was completed in April 2004.

The purpose of this report is to update the groundwater supply conditions and current GRP and to recommend a RAC for the East Whitewater River Subbasin AOB.

CHAPTER III
GROUNDWATER BASIN DESCRIPTION

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GROUNDWATER BASIN DESCRIPTION

A. Geology

The Coachella Valley Groundwater Basin, as described by the California Department of Water Resources (CDWR), is bounded on the north and east by non-waterbearing crystalline rocks of the San Bernardino and Little San Bernardino Mountains and on the south and west by the crystalline rocks of the Santa Rosa and San Jacinto Mountains. At the west end of the San Gorgonio Pass, between Beaumont and Banning, the basin boundary is defined by a surface drainage divide separating the Coachella Valley Groundwater Basin from the Beaumont Groundwater Basin of the Upper Santa Ana drainage area.

The southern boundary is formed primarily by the watershed of the Mecca Hills and by the northwest shoreline of the Salton Sea running between the Santa Rosa Mountains and Mortmar. Between the Salton Sea and Travertine Rock, at the base of the Santa Rosa Mountains, the lower boundary coincides with the Riverside/Imperial County Line.

Southerly of the southern boundary, at Mortmar and at Travertine Rock, the subsurface materials are predominantly fine grained and low in permeability; although groundwater is present, it is not readily extractable. A zone of transition exists at these boundaries; to the north the subsurface materials are coarser and more readily yield groundwater.

Although there is interflow of groundwater throughout the groundwater basin, fault barriers, constrictions in the basin profile and areas of low permeability limit and control movement of groundwater. Based on these factors, the groundwater basin has been divided into subbasins and subareas as described by CDWR in 1964 and the United States Geological Survey (USGS) in 1971.

The subbasins present in the Coachella Valley are the Mission Creek, Desert Hot Springs, Garnet Hill, San Gorgonio Pass, and Whitewater River (Indio) Subbasins. The subbasins, with their groundwater storage reservoirs, are defined without regard to water quantity or quality. They delineate areas underlain by formations which readily yield the stored water through water wells and offer natural reservoirs for the regulation of water supplies.

The boundaries between subbasins within the groundwater basin are generally defined by faults that serve as effective barriers to the lateral movement of groundwater. Minor subareas have also been delineated, based on one or more of the following geologic or hydrologic characteristics: type of water bearing formations, water quality, areas of confined groundwater, forebay areas, groundwater divides and surface drainage divides.

The following is a list of the subbasins and associated subareas, based on the CDWR and USGS designations:

- Mission Creek Subbasin
- Desert Hot Springs Subbasin
  - Miracle Hill Subarea
  - Sky Valley Subarea
  - Fargo Canyon Subarea
- Garnet Hill Subbasin

- San Gorgonio Pass Subbasin
- Whitewater River (Indio) Subbasin
  - Palm Springs Subarea
  - Thermal Subarea
  - Thousand Palms Subarea
  - Oasis Subarea

Figure 1 shows the locations of these subbasins. This report focuses on the Whitewater River (Indio) Subbasin, but also presents brief descriptions of the Desert Hot Springs Subbasin, Garnet Hill Subbasin, San Gorgonio Pass Subbasin, and Whitewater River (Indio) Subbasin for context.

The following are areas within the Coachella Valley where a supply of potable groundwater is not readily available:

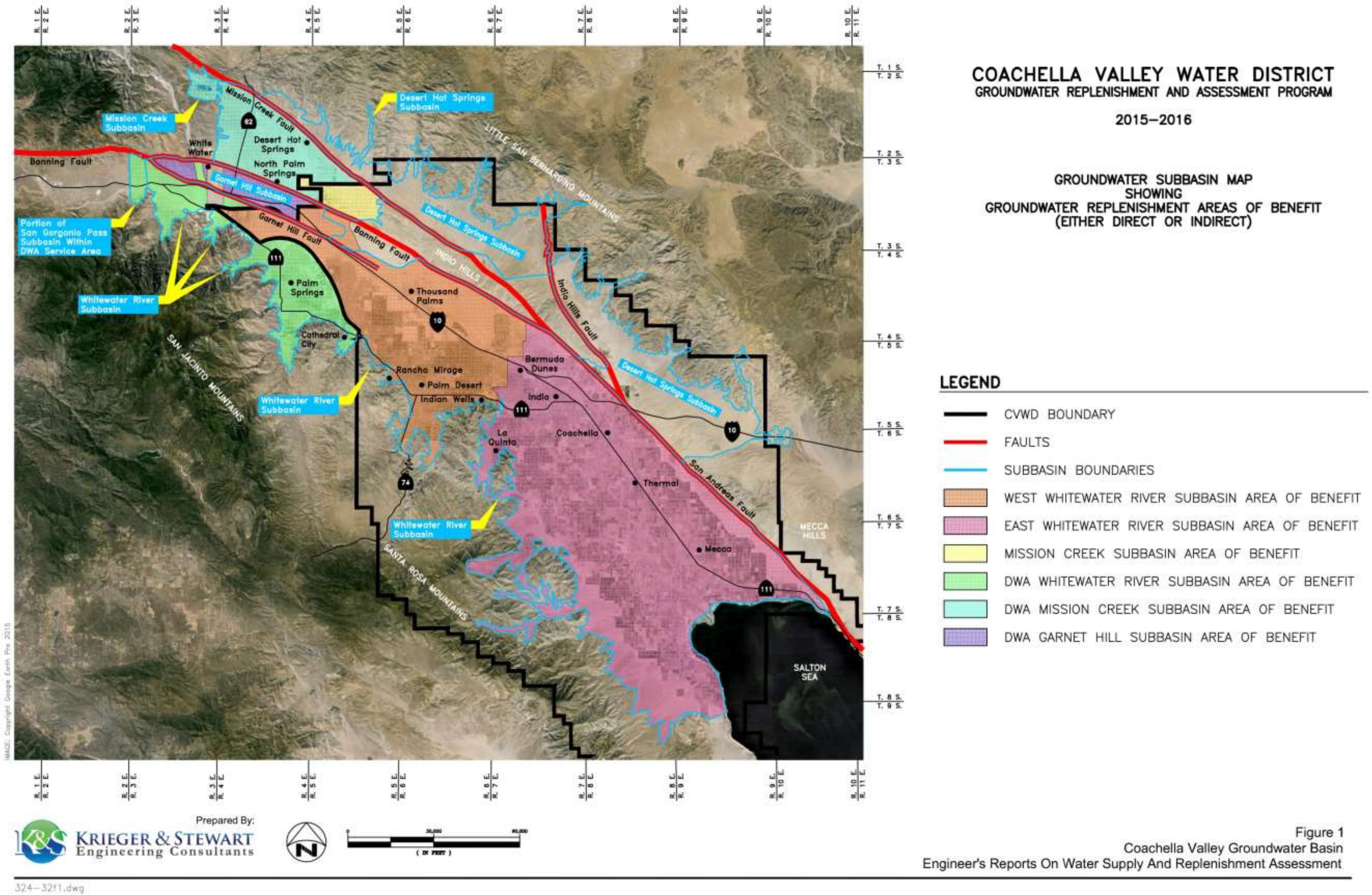
- Indio Hills area
- Mecca Hills area
- Barton Canyon area
- Bombay Beach area
- Salton City area

B. Mission Creek Subbasin

Water bearing materials underlying the Mission Creek upland comprise the Mission Creek Subbasin. This subbasin is designated number 7-21.02 in CDWR's Bulletin 118 (2003). The subbasin is bounded on the south by the Banning Fault and on the north and east by the Mission Creek Fault. It is bordered on the west by non-water bearing rocks of the San Bernardino Mountains. To the southeast of the subbasin are the Indio Hills, which consist of the semiwater-bearing Palm Springs Formation.

This subbasin relies on the same imported SWP/Colorado River Exchange water source for replenishment as does the Whitewater River Subbasin. CVWD, DWA, and Mission Springs Water District jointly manage this subbasin under the terms of the 2004 Mission Creek Settlement Agreement. This agreement and the 2003 Mission Creek Groundwater Replenishment Agreement between CVWD and DWA specify that the available SWP water will be allocated between the Mission Creek and Whitewater River Subbasins in proportion to the amount of water produced or diverted from each subbasin during the preceding year.

Figure 1
Coachella Valley Groundwater Basin



C. Desert Hot Springs Subbasin

The Desert Hot Springs Subbasin is bounded on the north by the Little San Bernardino Mountains and on the southeast by the Mission Creek and San Andreas Faults. The Mission Creek Fault separates the Desert Hot Springs Subbasin from the Mission Creek Subbasin, and the San Andreas Fault separates the Desert Hot Springs Subbasin from the Whitewater River Subbasin. Both faults serve as effective barriers to lateral groundwater flow. The subbasin has been divided into three subareas: Miracle Hill, Sky Valley, and Fargo Canyon. This subbasin is designated number 7-21.03 in CDWR's Bulletin 118 (2003).

The Desert Hot Springs Subbasin is not extensively developed except in the area of Desert Hot Springs. Relatively poor groundwater quality has limited the use of this subbasin for groundwater supply. The Miracle Hill Subarea underlies portions of the City of Desert Hot Springs and is characterized by hot mineralized groundwater, which supplies a number of spas in that area. The Fargo Canyon Subarea underlies a portion of the planning area along Dillon Road north of Interstate 10. This area is characterized by coarse alluvial fans and stream channels flowing out of Joshua Tree National Park. Based on limited groundwater data for this area, flow is generally to the southeast. Water quality is relatively poor with salinities in the range of 700 to over 1,000 mg/L.

D. Garnet Hill Subbasin

The area between the Garnet Hill Fault and the Banning Fault, named the Garnet Hill Subarea of the Indio Subbasin by CDWR (1964), was considered a distinct subbasin by the USGS because of the partially effective Banning and Garnet Hill Faults as barriers to lateral groundwater movement. This is demonstrated by a difference of 170 feet in groundwater level elevation in a horizontal distance of 3,200 feet across the Garnet Hill Fault, as measured in the spring of 1961. The Garnet Hill Fault does not reach the surface, and is probably effective as a barrier to lateral groundwater movement only below a depth of about 100 feet (MWH 2013).

The 2013 Mission Creek and Garnet Hill Subbasins Water Management Plan states groundwater production is low in the Garnet Hill Subbasin and is not expected to increase significantly in the future due to relatively low well yields compared to those in the Mission Creek Subbasin. Water levels in the western and central portion of the subbasin show response to large replenishment quantities from the Whitewater River Replenishment Facility, while levels are relatively flat in the eastern portion of the subbasin. The lack of wells in the subbasin limits the geologic understanding of how this subbasin operates relative to the Mission Creek and Whitewater River Subbasins.

Although some natural replenishment to this subbasin may come from Mission Creek and other streams that pass through during periods of high flood flows, the chemical character of the groundwater plus its direction of movement indicate that the main source of replenishment to the subbasin comes from the Whitewater River through the permeable deposits which underlie Whitewater Hill. This subbasin is considered part of the Whitewater River (Indio) Subbasin in CDWR's Bulletin 118 (2003) (MWH 2013).

E. San Gorgonio Pass Subbasin

The San Gorgonio Pass Subbasin lies entirely within the San Gorgonio Pass, bounded by the San Bernardino Mountains on the north and the San Jacinto Mountains on the south (CDWR 2003). This subbasin is designated number 7-21.04 in CDWR's Bulletin 118 (2003).

The San Gorgonio Pass Subbasin is also hydrologically connected to the Whitewater River Subbasin on the east. Groundwater within the San Gorgonio Pass Subbasin moves from west to east and spills out into the Whitewater River Subbasin over the suballuvial bedrock constriction at the east end of the pass (CDWR 1964).

CVWD's service area does not encompass any portion of the San Gorgonio Pass Subbasin.

F. Whitewater River (Indio) Subbasin

The Whitewater River Subbasin, designated the Indio Subbasin (Basin No. 7-21.01) in CDWR Bulletin No. 118 (2003), underlies the major portion of the Coachella Valley floor and encompasses approximately 400 square miles. Beginning approximately one mile west of the junction of State Highway 111 and Interstate 10, the Whitewater River Subbasin extends southeast approximately 70 miles to the Salton Sea.

The Subbasin is bordered on the southwest by the Santa Rosa and San Jacinto Mountains and is separated from Garnet Hill, Mission Creek and Desert Hot Springs Subbasins to the north and east by the Garnet Hill and San Andreas Faults (CDWR 1964). The Garnet Hill Fault, which extends southeastward from the north side of San Gorgonio Pass to the Indio Hills, is a relatively effective barrier to lateral groundwater movement from the Garnet Hill Subbasin into the Whitewater River Subbasin, with some portions in the shallower zones more permeable. The San Andreas Fault, extending southeastward from the junction of the Mission Creek and Banning Faults in the Indio Hills and continuing out of the basin on the east flank of the Salton Sea, is also an effective barrier to lateral groundwater movement from the northeast.

The subbasin underlies the cities of Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, Indian Wells, La Quinta, Indio, and Coachella, and the unincorporated communities of Thousand Palms, Thermal, Bermuda Dunes, Oasis, and Mecca. From about Indio southeasterly to the Salton Sea, the subbasin contains increasingly thick layers of silt and clay, especially in the shallower portions of the subbasin. These silt and clay layers, which are remnants of ancient lake bed deposits, impede the percolation of water applied for irrigation and limit groundwater replenishment opportunities to the westerly fringe of the subbasin.

In 1964, CDWR estimated that the five subbasins that make up the Coachella Valley groundwater basin contained a total of approximately 39.2 million AF of water in the first 1,000 feet below the ground surface; much of this water originated as runoff from the adjacent mountains. Of this amount, approximately 28.8 million AF of water was stored in the Whitewater River Subbasin. However, the amount of water in the Whitewater River Subbasin has decreased over the years due to pumping to serve urban, rural, and agricultural development in the Coachella Valley, which has withdrawn water at a rate faster than its rate of replenishment.

The Whitewater River Subbasin is not adjudicated. From a management perspective, CVWD divides the subbasin into two management areas designated the West (Upper) Whitewater River Subbasin AOB and the East (Lower) Whitewater River Subbasin AOB. The dividing line between these two areas is an irregular line trending northeast to southwest between the Indio Hills north of the City of Indio and Point Happy in La Quinta. The West Whitewater River Subbasin AOB is jointly managed by CVWD and DWA under the terms of the 1976 Water Management Agreement. The East Whitewater River Subbasin AOB is managed by CVWD.

The Whitewater River Subbasin is divided into four subareas: Palm Springs, Thermal, Thousand Palms, and Oasis. The Palm Springs Subarea is the forebay or main area of replenishment to the subbasin, and the Thermal Subarea is the pressure or confined area within the basin. The other two subareas are peripheral areas having unconfined groundwater conditions.

1. Palm Springs Subarea

The triangular area between the Garnet Hill Fault and the east slope of the San Jacinto Mountains southeast to Cathedral City is designated the Palm Springs Subarea. Groundwater is unconfined in this area. The Coachella Valley fill materials within the Palm Springs Subarea are essentially heterogeneous alluvial fan deposits with little sorting and little fine grained material content. The thickness of these water bearing materials is not known; however, it exceeds 1,000 feet. Although no lithologic distinction is apparent from well drillers' logs, the probable thickness of recent deposits suggests that Ocotillo conglomerate underlies recent fanglomerate in the subarea at depths ranging from 300 to 400 feet.

Natural replenishment to the aquifer in the Whitewater River subbasin occurs primarily in the Palm Springs Subarea. The major natural sources include infiltration of stream runoff from the San Jacinto Mountains and the Whitewater River, and subsurface inflow from the San Gorgonio Pass and Garnet Hill Subbasins. Deep percolation of direct precipitation on the Palm Springs Subarea is considered negligible as it is consumed by evapotranspiration.

2. Thermal Subarea

Groundwater of the Palm Springs Subarea moves southeastward into the interbedded sands, silts, and clays underlying the central portion of the Coachella Valley. The division between the Palm Springs Subarea and the Thermal Subarea is near Cathedral City. The permeabilities parallel to the bedding of the deposits in the Thermal Subarea are several times the permeabilities perpendicular to the bedding and, therefore, movement of groundwater parallel to the bedding predominates. Confined or semi-confined groundwater conditions are present in the major portion of the Thermal Subarea. Movement of groundwater under these conditions is present in the major portion of the Thermal Subarea and is caused by differences in piezometric (pressure) level or head. Unconfined or free water conditions are present in the alluvial fans at the base of the Santa Rosa Mountains, such as the fans at the mouth of Deep Canyon and in the La Quinta area.

Sand and gravel lenses underlying this Subarea are discontinuous, and clay beds are not extensive. However, two aquifer zones separated by a zone of finer-grained materials were identified from well logs. The fine-grained materials within the intervening horizontal plane are not tight enough or persistent enough to completely restrict the vertical interflow of water, or to warrant the use of the term "aquiclude". Therefore, the term "aquitard" is used for this zone of less permeable material that separates the upper and lower aquifer zones in the southeastern part of the valley.

The lower aquifer zone, composed of part of the Ocotillo conglomerate, consists of silty sands and gravels with interbeds of silt and clay. It contains the greatest quantity of stored groundwater in the Coachella Valley Groundwater Basin, but serves only that portion if the Valley easterly of Washington Street. The top of the lower aquifer zone is present at a depth ranging from 300 to 600 feet below the surface. The thickness of the zone is undetermined, as the deepest wells present in the Coachella Valley have not penetrated it in its entirety. The available data indicate that the zone is at least 500 feet thick and may be in excess of 1,000 feet thick.

The aquitard overlying the lower aquifer zone is generally 100 to 200 feet thick, although in small areas on the periphery of the Salton Sea it is more than 500 feet thick. North and west of Indio, in a curved zone approximately one mile wide, the aquitard is apparently lacking and no distinction is made between the upper and lower aquifer zones.

Capping the upper aquifer zone in the Thermal Subarea is a shallow fine-grained zone in which semi-perched groundwater is present. This zone consists of recent silts, clays, and fine sands and is relatively persistent southeast of Indio. It ranges from zero to 100 feet thick and is generally an effective barrier to deep percolation. However, north and west of Indio, the zone is composed mainly of clayey sands and silts and its effect in retarding deep percolation is limited. The low permeability of the materials southeast of Indio has contributed to irrigation drainage problems of the area. Semi-perched groundwater has been maintained by irrigation water applied to agricultural lands south of Point Happy, necessitating the construction of an extensive subsurface tile drain system.

The Thermal Subarea contains the division between the west and east portions of the Whitewater River (Indio) Subbasin. Primarily due to the application of imported water from the Coachella Canal, and an attendant reduction in groundwater pumpage, the water levels in the area southerly from Point Happy (in La Quinta) rose until the early 1970s, while the water table in the area northerly from Point Happy was dropping. This division forms the southern boundary of the management area of the Management Agreement between CVWD and DWA. Water level measurements have shown no distinction between the Palm Springs Subarea and the Thermal Subarea. The distinction has been is that in the Thermal Subarea at Point Happy the groundwater levels until recently were stabilized, neither rising nor falling significantly. This is changing as increased pumpage is again lowering the groundwater levels in the east portion of the Whitewater River (Indio) Subbasin.

CVWD recently completed a study to evaluate the entire groundwater basin. This led to the development and adoption of the 2010 CVWMP Update. Using state-of-the-art technology, CVWD developed and calibrated a peer-reviewed, three-dimensional groundwater model (Fogg 2000) that is based on data from over 2,500 wells, and includes an extensive database of well chemistry reports, well completion reports, electric logs, and specific capacity tests. This model improved on previous groundwater models, and incorporates the latest hydrological evaluations from previous studies conducted by CDWR and USGS to gain a better understanding of the hydrogeology in this subbasin and the benefits of water management practices identified in the CVWMP.

3. Thousand Palms Subarea

The small area along the southwest flank of the Indio Hills is named the Thousand Palms Subarea. The southwest boundary of the subarea was determined by tracing the limits of distinctive groundwater chemical characteristics. The major aquifers of the Whitewater River (Indio) Subbasin are characterized by calcium bicarbonate; but water in the Thousand Palms Subarea is characterized by sodium sulfate.

The differences in water quality suggest that replenishment to the Thousand Palms Subarea comes primarily from the Indio Hills and is limited in supply. The relatively sharp boundary between chemical characteristics of water derived from the Indio Hills and groundwater in the Thermal Subarea suggests there is little intermixing of the two waters.

The configuration of the water table north of the community of Thousand Palms is such that the generally uniform, southeasterly gradient in the Palm Springs Subarea diverges and steepens to the east along the base of Edom Hill. This steepened gradient suggests a barrier to the movement of groundwater: possibly a reduction in permeability of the water-bearing materials, or possibly a southeast extension of the Garnet Hill Fault. However, such an extension of the Garnet Hill Fault is unlikely. There is no surface expression of such a fault, and the gravity measurements taken during the 1964 CDWR investigation do not suggest a subsurface fault. The residual gravity profile across this area supports these observations. The sharp increase in gradient is therefore attributed to lower permeability of the materials to the east.

Most of the Thousand Palms Subarea is located within the west portion of the Whitewater River (Indio) Subbasin. Groundwater levels in this area show similar patterns to those of the adjacent Thermal Subarea, suggesting a hydraulic connectivity.

4. Oasis Subarea

Another peripheral zone of unconfined groundwater that is different in chemical characteristics from water in the major aquifers of the Whitewater River (Indio) Subbasin is found underlying the Oasis Piedmont slope. This zone, named the Oasis Subarea, extends along the base of the Santa Rosa Mountains. Water bearing materials underlying the subarea consist of highly permeable fan deposits. Although groundwater data suggest that the boundary between the

Oasis and Thermal Subareas may be a buried fault extending from Travertine Rock to the community of Oasis, the remainder of the boundary is a lithologic change from the coarse fan deposits of the Oasis Subarea to the interbedded sands, gravel and silts of the Thermal Subarea. Little information is available as to the thickness of the waterbearing materials, but it is estimated to be in excess of 1,000 feet. Groundwater levels in the Oasis Subarea have exhibited similar declines as elsewhere in the Subbasin due to increased groundwater pumping to meet agricultural demands on the Oasis slope.

5. Summary

The Whitewater River (Indio) Subbasin consists of four Subareas: the Palm Springs, Thermal, Thousand Palms, and Oasis Subareas. The Palm Springs Subarea is the forebay or main area of replenishment to the Subbasin, and the Thermal Subarea constitutes the pressure or confined area within the basin. The Thousand Palms and Oasis Subareas are peripheral areas having unconfined groundwater conditions. From a management perspective, the Whitewater River (Indio) Subbasin is commonly divided into a west and east portion, with the dividing line extending from Point Happy in La Quinta to the northeast, terminating at the San Andreas Fault and the Indio Hills at Jefferson Street.

For the purpose of this report, the east portion of the Whitewater River (Indio) Subbasin is defined generally as that portion of the Thermal Subarea east of this line, and the Oasis Subarea.

CHAPTER IV
WATER SUPPLY

CHAPTER IV
WATER SUPPLY

A. Groundwater Storage

In 1964, CDWR estimated that the subbasins in the Coachella Valley Groundwater Basin contained, in the first 1,000 feet below the ground surface, approximately 39,200,000 AF of water. The capacities of the subbasins are shown in **Table 1**.

Table 1
Groundwater Storage Coachella Valley Groundwater Basin

Area	Storage (AF)[1]
Whitewater River Subbasin	
Palm Springs Subarea	4,600,000
Thousand Palms Subarea	1,800,000
Oasis Subarea	3,000,000
Thermal Subarea	19,400,000
Subtotal Whitewater River (Indio) Subbasin:	28,800,000
San Gorgonio Pass Subbasin	2,700,000
Mission Creek Subbasin	2,600,000
Desert Hot Springs Subbasin	4,100,000
Garnet Hill Subbasin	1,000,000
Total All Subbasins:	**39,200,000**

(1) First 1,000 feet below ground surface. CDWR estimate (CDWR, 1964).

Currently, the Whitewater River (Indio) Subbasin is developed to the point where significant groundwater production occurs. Imported SWP water allocations are replenished in the West Whitewater River Basin to replace consumptive uses created by the resort-recreation economy and permanent resident population. The imported Colorado River supply through the Coachella Canal is used mainly for irrigation in the East Whitewater River Subbasin. Annual deliveries of Colorado River water through the Coachella Canal of approximately 300,000 AF are a significant component of southeastern valley hydrology.

B. Precipitation and Streamflow

Average annual precipitation in the Coachella Valley varies from four inches on the valley floor to more than 30 inches in the surrounding mountains (CDWR 1964). Precipitation predominantly occurs December through March, with occasional intense precipitation events during the summer months resulting from subtropical thunderstorms. The precipitation that occurs within the tributary watersheds either evaporates, is consumed by native vegetation, percolates into underlying alluvium and fractured rock or becomes runoff. A portion of the flow percolating into the mountain watersheds eventually becomes subsurface inflow to the subbasins.

Precipitation in the surrounding mountains is included in the natural inflow estimates found in the water balance calculated in **Table 3** of this report. The natural inflow estimates are based on the Coachella Valley Groundwater Flow Model data (prepared by MWH and others), which was utilized for the 2010 CVWMP Update and 2014 Status Report to the 2010 CVWMP Update (2014 Status Report).

The average annual rainfall within the East Whitewater River Subbasin AOB is approximately three inches, as reported by the Western Regional Climate Center station located at the Thermal FAA airport, in Thermal California.

During 2014, the annual average rainfall recovered by rain gauge stations at the Thermal FAA Airport, Mecca Landfill, and Oasis as monitored by Riverside County Flood Control and Water Conservation District within the east portion of the Whitewater River Subbasin was approximately 0.45 inches, much less than the typical average annual rainfall for the area.

C. Non-Potable Water

CVWD began producing reclaimed or recycled water in 1967. Recycled water is a significant potential local resource that can be used to help reduce overdraft. Although treated wastewater is not yet suitable for direct potable use, wastewater that has been treated to meet State standards can be reused for landscape irrigation and other purposes. Recycled wastewater has historically been used for irrigation of golf courses and municipal landscaping in the Coachella Valley.

CVWD operates six WRPs in the Coachella Valley. Recycled water from two of these facilities (WRP 9 and WRP 10) has been used for golf course and greenbelt irrigation in the Palm Desert area for many years, thereby reducing demand on the groundwater basin. A third facility (WRP 7), located north of Indio, began providing recycled water for golf course and greenbelt irrigation in 1997. CVWD is currently planning to expand non-potable water (imported water and recycled water) use within the central portion of the Coachella Valley (mid-valley).

CVWD continues to work with groundwater users such as farmers, golf courses and others to encourage the use of non-potable water. Urban irrigation will use non-potable water as development progresses within this subbasin. This program will be implemented over the next thirty years and is expected to reduce groundwater production from the Whitewater River Subbasin.

There are approximately 35 golf courses in the East Coachella Valley per the 2010 CVWMP Update. CVWD developed a new non-potable water use agreement in 2010 requiring golf courses with access to Canal or recycled water to meet a minimum of 80 percent of irrigation demand from those sources. To date, 25 of those golf courses are existing Coachella Canal customers. There are approximately three golf courses proposed for conversion from irrigation with groundwater to irrigation with non-potable water by the end of fiscal year 2016. Conversions are an important element in the continuing efforts to reduce the quantity of groundwater extracted from the basin, contributing to the reduction of overdraft within the East Whitewater River Subbasin.

The Oasis Area Irrigation Project is an "in-lieu" replenishment project, located strictly within the East Whitewater River Subbasin AOB, which is designed to help eliminate overdraft, and is estimated to reduce groundwater production by approximately 32,000 AF/Yr by providing Canal water for irrigation as described in the 2010 CVWMP. Construction of the Oasis Area Irrigation is scheduled to begin in September 2015.

The benefits of completing the connections within the East Whitewater River Subbasin AOB, and shown in **Figure 5**, include preserving potable water supplies and reducing land subsidence. Offsetting groundwater pumping with delivery of non-potable water for irrigation use also reduces the decline in groundwater levels (stabilization), the decline of groundwater in storage, and the effects of land subsidence.

D. Groundwater Levels

Historical water level declines in the Coachella Valley Groundwater Basin and conditions producing said declines have been extensively described by the USGS and CDWR, and are documented in the 2010 CVWMP Update and 2014 Status Report. The 2014 Status Report demonstrates that the programs set forth in the 2010 CVWMP Update are effectively reducing overdraft within the groundwater basin based on the increase in water levels. Such programs include replenishment, source substitution (golf course conversions), expansion of Canal water and recycled water use, and various other conservation programs.

Although groundwater levels have been declining throughout most of the subbasins since 1945, water levels in the eastern portion of the Coachella Valley had risen until the early 1970s due to importation of water from the Coachella Canal and the resulting decreased pumpage in that area. However, groundwater levels began to decline again in the 1980s due to increasing urbanization and increased groundwater use by domestic water purveyors, local farmers, golf courses, and fish farms.

The historic declining water table in the east portion of the Whitewater River Subbasin led to the determination that a management program was required to stabilize water levels and prevent other adverse effects such as water quality degradation and land subsidence. CVWD's East Whitewater River Subbasin AOB GRP was developed to serve this need and became effective in 2005. Since then, groundwater levels in wells throughout most of the east portion of the Whitewater River Subbasin have stabilized or are rising.

Water surface elevations in the northwestern area of the valley are highest at the northwest end of each Subbasin, indicating that regional groundwater flow is typically from the northwest to the southeast in the center of the Coachella Valley.

Figure 2 depicts the change in average groundwater levels from 2013 to 2014 in the east portion of the Whitewater River Subbasin based on CVWD's groundwater level monitoring well data. The East Whitewater River Subbasin AOB boundary and the locations of the TEL Replenishment Facility and Martinez Canyon Pilot Replenishment Facility are also shown in **Figure 2**.

The colored contours in **Figure 2** represent water level changes for 145 wells in the East Whitewater River Subbasin AOB monitored by CVWD staff. The average rise in water levels observed in these monitored wells from 2013 to 2014 was 3.0 feet. **Figure 2** includes 18 monitoring wells located at the TEL Replenishment Facility, which experienced dramatic fluctuations in water levels throughout the year in response to water deliveries to the facility. In 2014, water levels in those 18 monitoring wells increased approximately 8.0 feet, which increased the annual average water level within the East Whitewater River Subbasin AOB. Excluding the monitoring wells, the annual average change in groundwater levels in the AOB is an increase of 2.1 feet.

Figure 3 depicts the change in average groundwater levels from 2004 to 2014 in the east portion of the Whitewater River Subbasin based on CVWD's groundwater level monitoring well data.

The colored contours in **Figure 3** represent water level changes for 115 wells in the East Whitewater River Subbasin AOB monitored by CVWD staff. The average rise in water levels observed in these monitored wells from 2004 to 2014 was 13.2 feet.

As in **Figure 2**, the annual average change in groundwater levels from 2004 the 2014, excluding the 18 monitoring wells near the TEL Replenishment Facility, was an increase of 8.3 feet. The analysis of the groundwater levels observed at the monitoring wells emphasizes the benefit and effectiveness of the replenishment program in sustaining the water supplies. Without replenishment, water levels and supplies would likely decline, but with sufficient replenishment and other water management programs, water levels will stabilize.

Figure 2
Groundwater Level Changes in East Whitewater River Subbasin Area of Benefit from 2013 to 2014

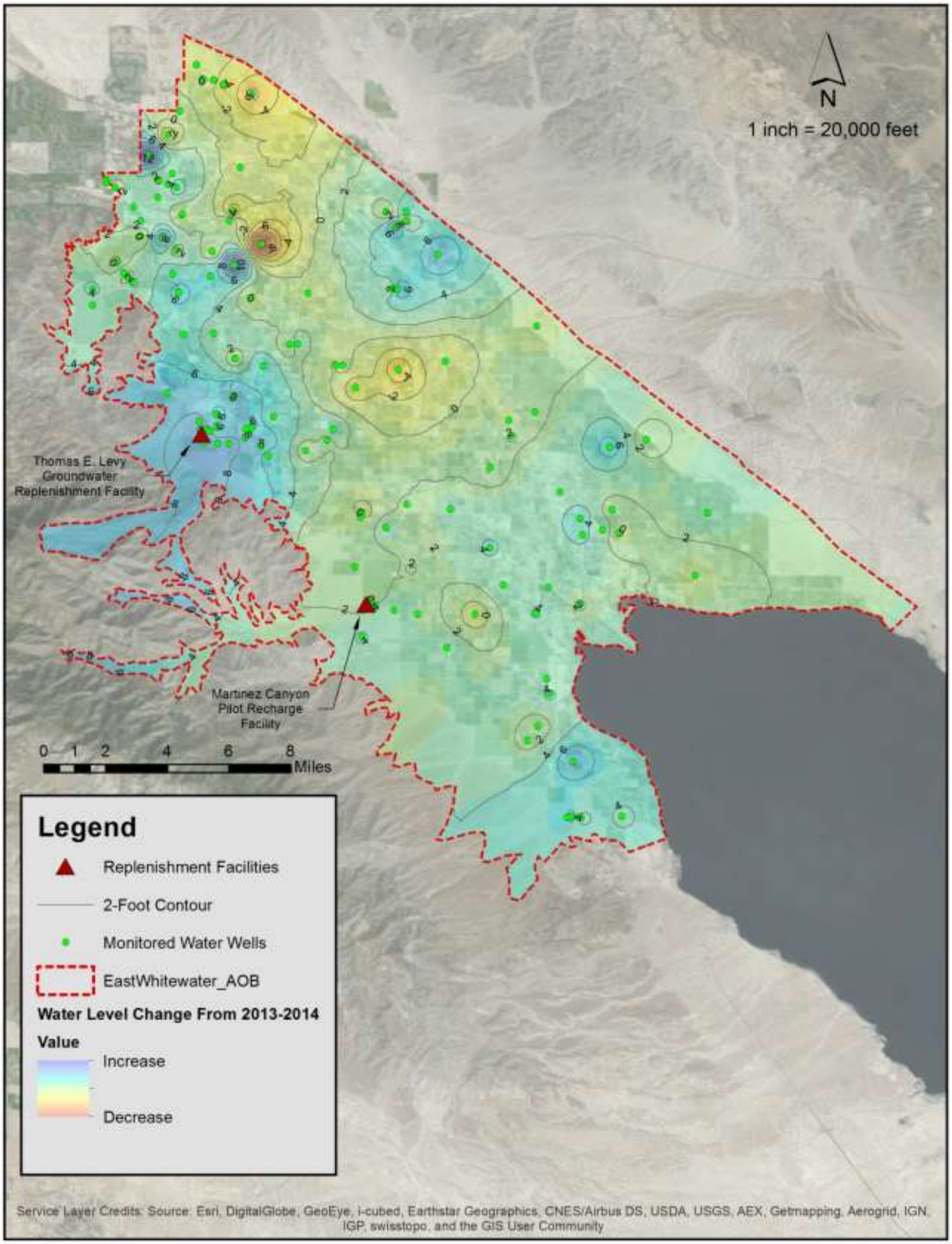
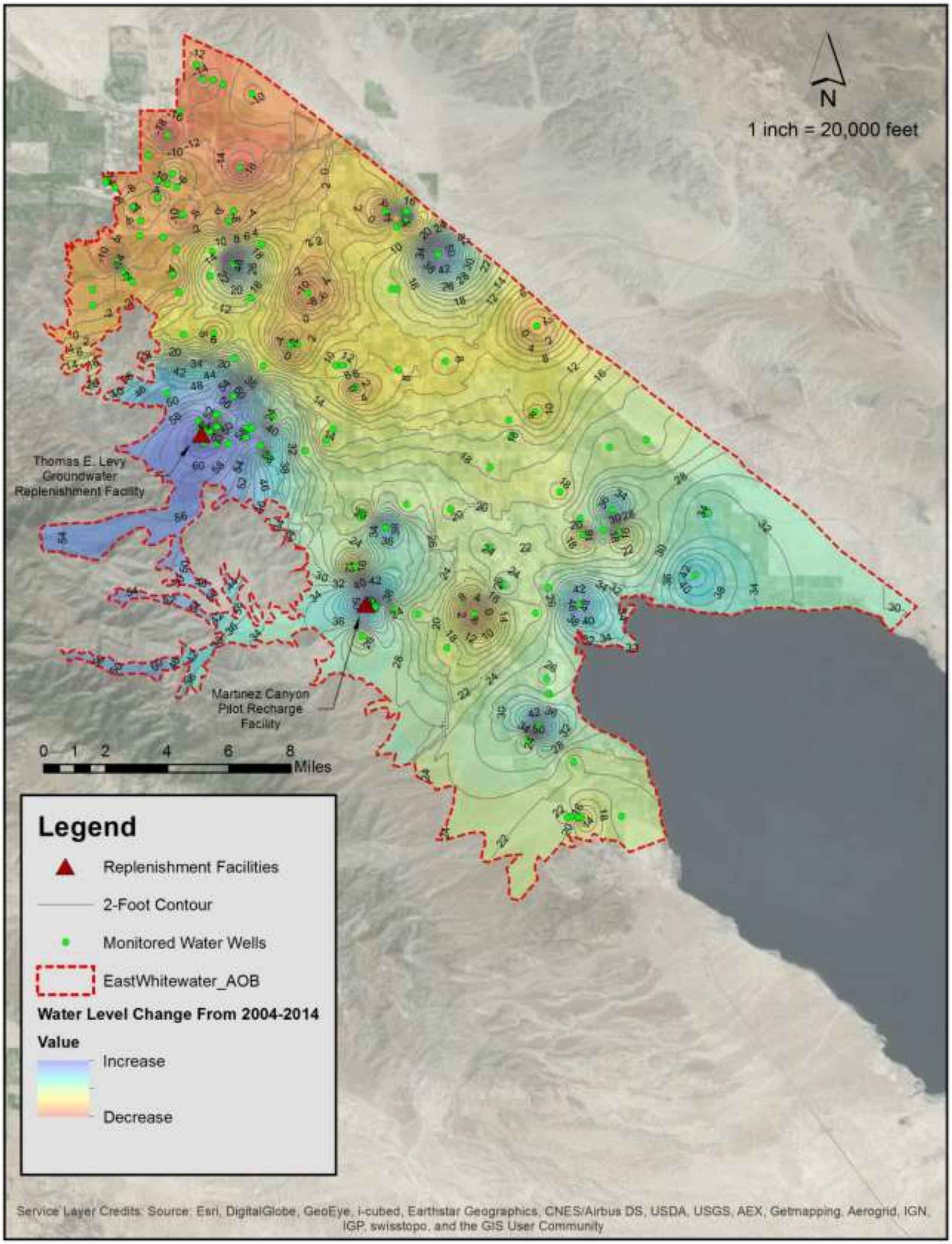


Figure 3
Groundwater Level Changes in East Whitewater River Subbasin Area of Benefit from 2004 to 2014



E. Management Area

CVWD manages groundwater in the east portion of the Whitewater River Subbasin as a separate unit from the west portion of the Whitewater River Subbasin. This management area was created in 2004 and consists of the southerly portion of the Thermal Subarea and the Oasis Subarea that were experiencing declining groundwater levels. The AOB for this management program coincides with the management area.

1. East Whitewater River Subbasin Area of Benefit Boundary

Figures 2 and 3 present the boundary of the East Whitewater River Subbasin AOB. This boundary is defined as follows:

> That east portion of the Whitewater River Subbasin within the boundaries of CVWD, beginning at the northerly extension of Jefferson Street located on the San Andreas Fault, south to Avenue 40, west to Adams Street, south to Fred Waring Drive (Avenue 44), west to Washington Street, south to the Santa Rosa Mountains near Point Happy. The area's western boundary continues south along the foothills of the Santa Rosa Mountains to the southwest corner of Section 25, Township 7 South, Range 7 East, thence to the southwest corner Of Section 36, Township 8 South, Range 8 East, which is approximately three miles due west of Travertine Rock.
>
> The boundary continues east along the Riverside County line to the southeast corner Of Section 34, Township 8 South, Range 9 East, which is inundated by the Salton Sea. The boundary continues northeasterly across the Salton Sea to the northeast corner of Section 34, Township 7 South, Range 10 East, thence northwesterly along the San Andreas Fault to the point of beginning.

2. Groundwater Production

As presented in the 2010 CVWMP Update, groundwater production within the East Whitewater River Subbasin AOB was estimated to be 168,300 AF/Yr during 1999. **Table 2** presents the estimated 2014 groundwater production in the East Whitewater River Subbasin AOB.

When the replenishment assessment was adopted in June 2004, the CVWD Board of Directors required groundwater producers to report their groundwater production. The reported production for 2014 was 123,465 AF.

3. Artesian Conditions

Historically, the eastern portion of the Whitewater River Subbasin experienced confined aquifer artesian conditions with sufficient pressure to cause groundwater levels in wells to rise above the ground surface. Artesian flowing wells attracted early settlers to farm in this area. Artesian conditions declined in the late 1930s when increased groundwater pumping caused declining groundwater water levels. The completion of the Coachella Canal by the U.S. Bureau of Reclamation in 1949 brought Colorado River water to the eastern Coachella Valley for agricultural irrigation purposes. Artesian conditions returned in the early 1960s through the 1980s as imported Colorado River water was substituted for groundwater production. Beginning in the late 1980s, groundwater use again increased, resulting in declining water levels and a loss of artesian conditions.

The East Whitewater River Subbasin AOB GRP combined with other water management elements including reduced fish farm production, source substitution, and water conservation are helping to control groundwater overdraft, restore water levels, and return artesian conditions within the east portion of the Whitewater River Subbasin. This results in reduced groundwater pumping costs and water quality protection of the confined aquifer.

As artesian conditions return, water pressure in the lower confined aquifer increases and can cause uncontrolled flows in wells that are not properly constructed and/or poorly maintained. The Coachella Valley Mosquito and Vector Control District and CVWD are cooperating in an effort to notify well owners of their responsibility to control artesian wells in accordance with state regulations, and offering artesian well owners who properly control artesian flows the opportunity to apply for a rebate to offset their costs. California Health and Safety Code, Section 2000-2007 states that flooding caused by artesian wells is a public nuisance which poses a risk to public health, safety and welfare. In addition, Section 305 of the California Water Code requires artesian wells to be capped or equipped with a mechanical appliance which will readily and effectively arrest and prevent the flow of water.

In accordance with Section 31638.5 of the California Water Code, producers who extract greater than 25 AF/Yr, including artesian flowing groundwater, are required to have water-measuring devices installed on all wells or other water producing facilities, and to report the total amount produced from all wells to CVWD on a monthly basis. Minimal pumpers are exempt from this provision. **Figure 4** depicts the current annual average artesian conditions within the east Whitewater River Subbasin; specifically, the water pressure equivalent elevation above ground surface.

4. Coachella Valley Land Subsidence Study

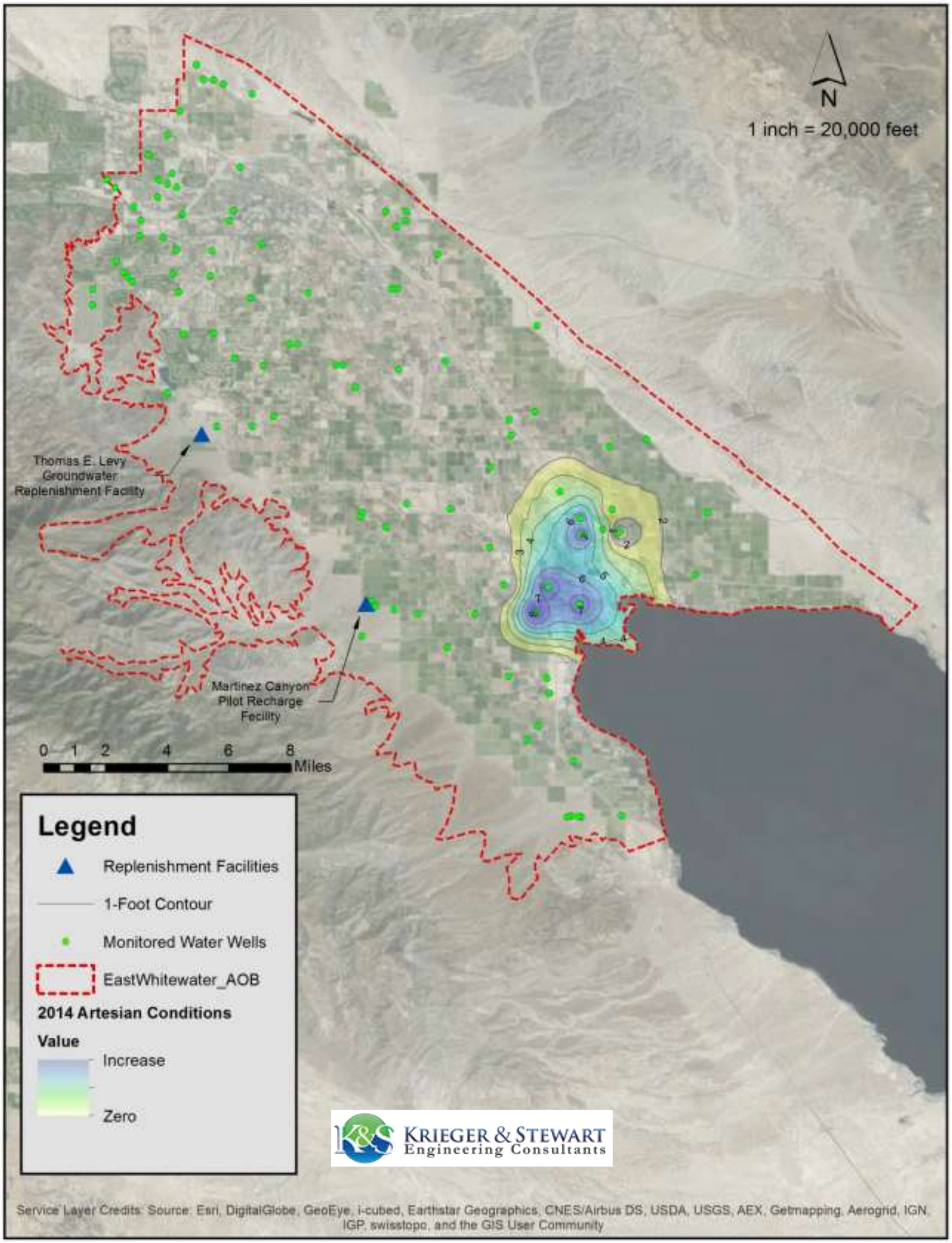
Since 1996, CVWD and the USGS have cooperatively funded studies investigating land subsidence in the Coachella Valley. Global Positioning System surveying and interferometric synthetic aperture radar methods are used to determine the location, extent, and magnitude of the vertical land-surface changes in the Coachella Valley. A report was published by the USGS in 2007 entitled Detection and Measurement of Land Subsidence Using Global Positioning System Surveying and Interferometric Synthetic Aperture Radar, Coachella Valley, California 1996-2005 (USGS 2007). The most recent phase of the investigation evaluated correlations between subsidence and recovery related to local geology and groundwater level changes during the period 1993 to 2010. The final report for this study was published by the USGS in 2014. This report indicated that subsidence continues to occur in the East Whitewater River Subbasin AOB and portions of the West Whitewater River Subbasin AOB due to declining water levels to the lowest levels on record in 2010. However, decreased rates of subsidence, or uplift, was observed throughout the La Quinta area. The uplift was attributed to the recovering water levels in the vicinity of the TEL Replenishment Facility (USGS 2014).

Table 2
Production within the East Whitewater River Management Area of Benefit

Year	AF[1]
1999	168,300
2002	166,700
2003	199,800
2004	172,300
2005	172,000
2006	172,000
2007	172,000
2008	172,000
2009	160,000
2010	150,000
2011	145,000
2012	120,064
2013	119,194
2014	123,465

(1) The 1999 production value is from the 2002 CVWMP, Table 3-2, Summary of Historical Water Supplies in 1936 and 1999. Production values for the years 2000 through 2011 were estimated from reported and projected unreported groundwater production. The 2012 and 2014 production values are equal to the reported groundwater production during those calendar years.

Figure 4
2014 Artesian Conditions (Elevations Above Ground surface) in East Whitewater Subbasin Area of Benefit



6. Groundwater Inflows and Outflows

Total inflows and outflows to the East Whitewater River Subbasin AOB in 2014 are summarized in **Table 3**. The estimated natural inflow of 33,136 AF/Yr includes natural replenishment and subsurface inflow across subbasin boundaries. The non-consumptive return of applied water is estimated at 150,180 AF, which is the sum of 34 percent of the estimated annual groundwater production (excluding 14,622 AF of wastewater discharges) and 34 percent of Colorado River water applied for irrigation within the AOB during 2014 (see **Page IV-11** for a more detailed explanation). The total inflow includes the natural inflow, the non-consumptive return, and the 36,030 AF of water replenished by CVWD at the replenishment facilities. The total outflow is the groundwater production estimate plus 58,190 AF/Yr of subsurface drainage (excluding 14,622 AF of wastewater and 4,987 AF of canal regulatory flows), evapotranspiration, evaporation losses, and net subsurface outflow to the Salton Sea.

Table 3
2014 Water Balance in the East Whitewater River Subbasin

Item	Annual Calculation (AF)
2014 Groundwater Production	-123,465
Non-Consumptive Return[1]	150,180
Natural Inflow[2]	33,136
Natural Outflow[3]	-58,190
Artificial Replenishment[4]	36,030
Annual Balance[5]	37,691

(1) Based on 34 percent of production ((123,465 AF-14,622) x 0.34 = 37,007 AF) plus 34 percent of Colorado River water applied for irrigation in the AOB ((337,849 - 4,987) x 0.34 =113,173)
(2) Includes 5,130 AF/Yr natural replenishment, 27,836 AF/Yr subsurface inflow from the west portion of the Whitewater River Subbasin, and 170 AF subsurface inflow from the Fargo Canyon Subarea of the Desert Hot Springs Subbasin (MWH 2014).
(3) Includes total subsurface drainage outflow excluding wastewater discharges and regulatory Canal water discharges (73,696 AF – 14,622 AF – 4,987 AF), evapotranspiration (4,857 AF), net subsurface flow to the Salton Sea (-1,248 AF) (MWH 2014), and two percent evaporation losses (71 AF).
(4) TEL Replenishment Facility received 36,030 AF and the Martinez Canyon Facility received 0 AF.
(5) This is an increase in stored groundwater equal to 0.01 percent of the Subbasin's storage capacity.

The annual balance is the total inflow less the total outflow for a gain of 37,691 AF of water in storage in the Subbasin 2014.

7. Overdraft

Groundwater overdraft is manifested not only as a prolonged decline in groundwater storage but also through secondary adverse effects including decreased well yields, increased energy costs, water quality degradation, and land subsidence. The 2010 CVWMP Update defines overdraft as the calculated change in storage based on long-term local hydrology and imported water deliveries. The CDWR California Water Plan Update 2009 defines overdraft as the condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that replenishes the basin over a period of years during which water supply conditions approximate average conditions.

In 2014, the annual water balance for the East Whitewater River Subbasin AOB was positive, providing an increase in the total groundwater in storage. Imported water may offset annual changes in the groundwater in storage in a particular year. However, on a long-term basis, water requirements are likely to continue to place demands on groundwater storage. The 2010 CVWMP Update outlines a plan to address long-term overdraft in the Coachella Valley. Based on the water balance information presented in **Table 3**, the East Whitewater River Subbasin AOB experienced a gain of 37,691 AF of water storage during 2014.

It should be noted that overdrafting the groundwater basin may allow poor quality water from irrigation return and the Salton Sea to replace fresh water storage. An ongoing GRP is necessary to continue to reduce declining groundwater levels and to avoid any detrimental water quality conditions that might otherwise occur.

Figure 5 shows the historic and projected change in the groundwater in storage based on the total outflow and total inflow estimated for the subbasin through 2035, as reported in past Engineer's Reports and projected by MWH as part of the 2014 Status Report.

The total historical outflow consist of the total groundwater produced from the subbasin, subsurface drainage outflow, and natural outflow as shown in **Table 3** within this Engineer's Report and past Engineer's Reports.

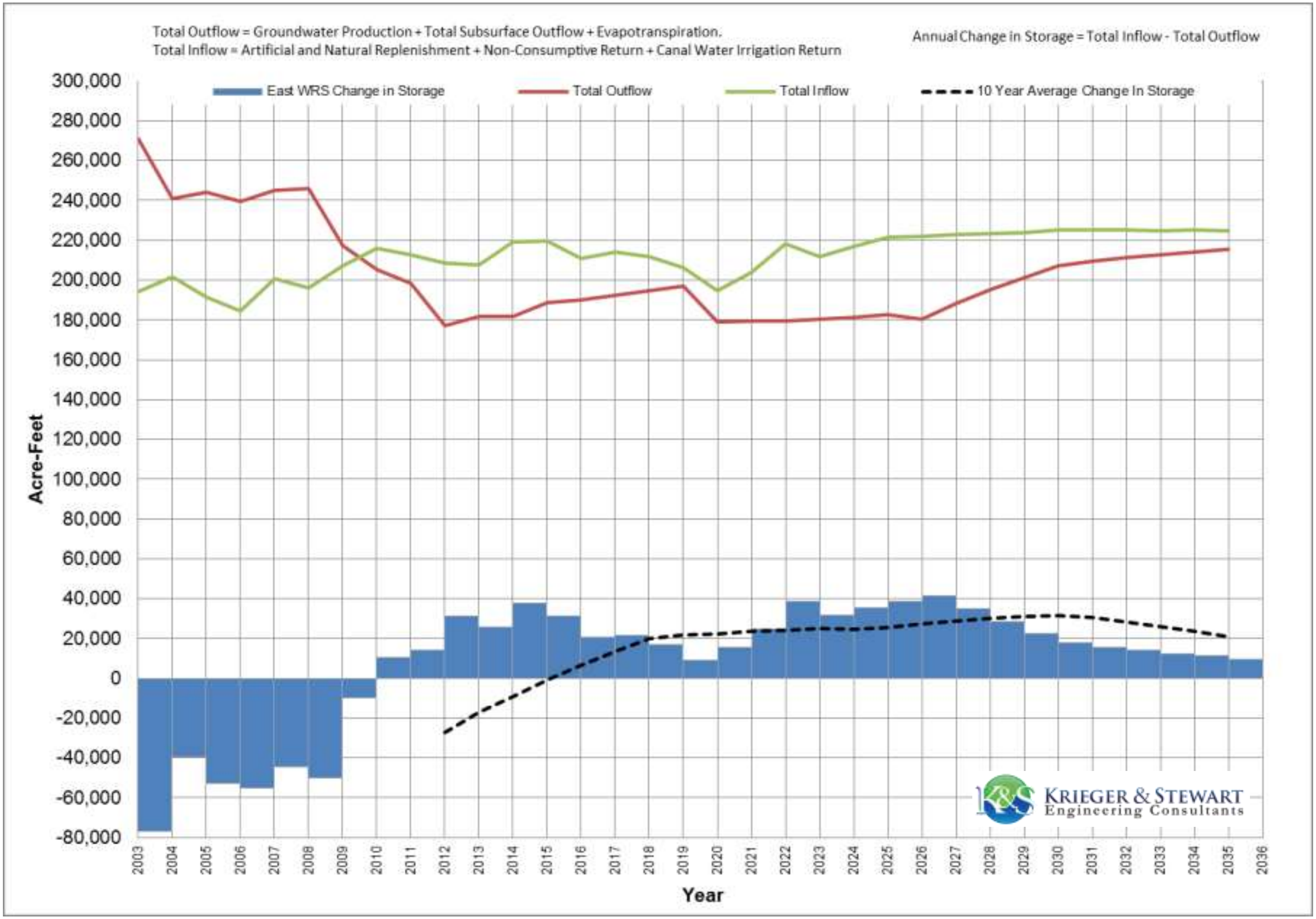
The total historical inflow consist of artificial groundwater replenishment, natural inflow, and non-consumptive return (35 percent of the total groundwater extractions and Canal water use), as shown on **Table 3** within this Engineer's Report and past Engineer's Reports.

Projected groundwater production figures were obtained for MWH (2010 Update to the CVWMP and the 2014 Status Report, with additional, updated information provided by MWH directly). Said projections consider population growth forecasts along with a reduction in the total groundwater produced as future projects such as the Oasis Irrigation Project, source substitution with non-potable water, and water conservation programs continue to be implemented.

Projections for artificial groundwater replenishment are based on the capacity of the TEL Replenishment Facility (40,000 AF/Yr), 4,000 AF/Yr to 20,000 AF/Yr replenished at Martinez Canyon, and 10,000 AF/Yr to be replenished by the City of Indio. Plans for the future extent of replenishment activities at the Martinez Canyon and Indio are actively being evaluated.

Projected natural inflow obtained from MWH include: projected subsurface flows from the West Whitewater River and Desert Hot Springs Subbasins; projected surface flows based on stream gauging and precipitation records; and projected non-consumptive return. Future non-consumptive return is expected to decrease from approximately 35 percent to 30 percent through 2035 based on the effects of implementation of water conservation measures such as turf removal, more efficient irrigation practices, and increased drain flows leaving the subbasin. As shown in **Table 3**, the estimated percentage of non-consumptive return for 2014 is approximately 34 percent per the 2014 Status Report (MWH).

Figure 5
East Whitewater River Subbasin Change in Groundwater Storage



CHAPTER V
REPLENISHMENT PROGRAM

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A. Current Replenishment Activities

The TEL Replenishment Facility is located just south of Lake Cahuilla at Dike 4, a major flood control dike, near Avenue 62 and Madison Street. This location is ideally suited for large-scale replenishment in the Thermal Subarea, given its proximity to Lake Cahuilla and its relative freedom from aquitards.

In 2014, CVWD replenished 36,030 AF/Yr at this location. Since 1997, 234,027 AF of water has been replenished at the TEL Replenishment Facility.

CVWD completed construction of a pilot replenishment facility and several monitoring wells on the Martinez Canyon alluvial fan in March 2005. This pilot facility was designed to replenish approximately 4,000 AF/Yr, but the results from the Martinez Canyon pilot project indicate the site may not be ideally suited for groundwater replenishment. At this time, water deliveries to the Martinez Canyon site have been discontinued, and received no water in 2014. CVWD continues to monitor groundwater in the Martinez Canyon area to assess any changes in water quality or supply conditions that would support groundwater replenishment at this site in the future.

The annual amounts of water delivered for replenishment at the TEL Replenishment Facility and Martinez Canyon Pilot Replenishment Facility are shown in **Table 4**.

Table 4
East Portion of the Whitewater River Subbasin Replenishment Deliveries

Year	Replenishment Delivery (AF/Yr)
1997	415
1998	1,364
1999	2,802
2000	1,813
2001	3,572
2002	2,360
2003	1,671
2004	3,450
2005	4,743
2006	2,648
2007	5,775
2008	7,473
2009	21,735
2010	37,401

Table 4
East Portion of the Whitewater River Subbasin Replenishment Deliveries

Year	Replenishment Delivery (AF/Yr)
2011	32,417
2012	33,166
2013	35,192
2014	36,030
Total	**234,027**

References: CVWD billing records

1. Monitoring Wells

Nine monitoring wells were installed near TEL Replenishment Facility in 1995 and are monitored quarterly for water quality and changes in water table elevation. Of these nine wells, four are shallow (176 to 315 feet), five are deep (543 to 740 feet), and are located both up and down-gradient of the original pilot ponds along Avenue 62.

Nine new monitoring wells were installed near TEL Replenishment Facility in 2009. Six wells are nested together in groups of two (one shallow and one deep) down-gradient of the facility, parallel to Dike 4. Three additional shallow monitoring wells are installed down-gradient of the facility at existing CVWD sites. The new monitoring wells are used to evaluate water quality and depth to water table, along with the original monitoring wells.

Monitoring wells at the Martinez Canyon Pilot Replenishment Facility were installed in 2001-2002 and are used to monitor water quality and water table elevation data. These wells range from a depth of 380 to 420 feet and are located down-gradient of the pilot ponds along Avenue 72.

Monitoring wells are also used to evaluate saline water intrusion from the Salton Sea into the fresh water aquifer. CVWD has been studying this potential problem since 1996 using a multiple zone monitoring well near Lincoln Street on the northwest end of the Salton Sea. This well allows the evaluation of water level and quality at four different depths below the ground surface. During 2002, CVWD completed construction of two additional multiple zone monitoring wells near Avenue 78 on the west side of the Salton Sea. Each monitoring well allows measurements from two aquifer zones in the Oasis area. Monitoring data for these wells from 2004 indicated water levels in the shallower aquifers ranged from 25 feet to 70 feet below the elevation of the Salton Sea. Current monitoring data shows water levels in these wells are under artesian pressure and range from five feet below to 35 feet above the current elevation of the Salton Sea.

Data from these monitoring wells also show that the water levels in the primary production aquifers are increasing. The depth to water in 2004 in the primary production aquifer was 40 to 100 feet below the ground surface. Current water levels at the multiple-zone monitoring well near Lincoln Street range from four feet below ground surface to nine feet above ground surface.

Many areas of the East Whitewater River Subbasin AOB have shallow semi-perched groundwater conditions. Since groundwater levels in this perched aquifer are typically eight to ten feet below ground surface (controlled by subsurface drains), there can be a downward vertical gradient between the perched aquifer and the primary production zone. Salts that accumulate in the semi-perched zone from irrigation use can migrate slowly through the aquitard into the deeper aquifers thereby degrading the water quality. Rising water levels in the primary production aquifer, displayed in recent data collected at the multiple zone monitoring wells, reduces the likelihood of salt water intrusion into the fresh water aquifer.

2. Replenishment Facilities

The TEL Replenishment Facility went online in June, 2009. The 2010 CVWMP Update recommends a goal of 40,000 AF/Yr at this facility. CVWD replenished 36,030 AF at this location in 2014.

Early benefits of replenishment from TEL Replenishment Facility to the lower aquifer are observed in measurements collected from monitoring wells near the facility. The 18 monitoring wells located at the TEL Replenishment Facility provide representative monitoring of the preliminary effects of the replenishment efforts. The nine original monitoring wells at the TEL Replenishment Facility show an average water level increase of 8.7 feet during 2014. The nine new monitoring wells installed in mid-2009 show an average water level increase of 60.7 feet from the time of installation through January 2015, and a 8.0 feet average increase in 2014. The average rise in water levels between 2013 and 2014 observed in the 145 East Whitewater River Subbasin AOB monitoring wells was 3.0 feet. One of the nine new monitoring wells installed in 2009 was installed into the upper perched aquifer. Water levels observed in this well increased approximately two feet in 2014.

CVWD continues to monitor and evaluate the need and feasibility of a replenishment facility on the Martinez Canyon alluvial fan.

In addition to the direct replenishment facilities described above, CVWD plans to provide non-potable water (imported water and recycled water) to replace groundwater pumping as identified in the 2010 CVWMP Update. CVWD continues to work with groundwater users such as farmers, golf courses and other users to encourage the use of non-potable water.

B. Future Replenishment Activities and Replenishment Model Projections

The extent of the AOB for the East Whitewater River Subbasin Management Area was determined during the course of preparation of the 2010 CVWMP Update and its associated PEIR that required extensive computer modeling of the Whitewater River Subbasin. The groundwater model allowed CVWD to gain a better understanding of water conditions in this subbasin and the benefits of water management activities identified in the 2010 CVWMP Update.

Figure 6 presents projected groundwater levels in 2045 during implementation of the 2010 CVWMP Update project (80,000 AF/Yr in the East Whitewater River Subbasin

AOB) compared to groundwater levels in 2009. Implementation of the project results in water levels that are 40 to 60 feet higher in the La Quinta area, and about 90 feet higher in the Oasis area.

Construction of a canal water distribution system in the Oasis area is a source substitution project identified in the 2010 CVWMP Update. This project will convert agricultural irrigation from groundwater to Colorado River water on the Oasis slope. This project will conserve groundwater, utilize available Colorado River water, and help reduce aquifer overdraft. To date, an Assessment District (AD34) boundary has been approved by the CVWD Board of Directors, a preliminary project design and theory of operations have been developed, and public outreach to landowners and operators has been completed. Preliminary locations and sizes have been approved for major facilities, such as reservoirs, pump stations, and pipelines. A construction contract will be awarded in 2015.

C. Other Replenishment Activities

GRPs are also under way in the Mission Creek Subbasin and the west portion of the Whitewater River Subbasin. These programs are described in separate Engineer's Reports.

Figure 6
Whitewater River Subbasin – Change in Water Levels from 2009 to 2045

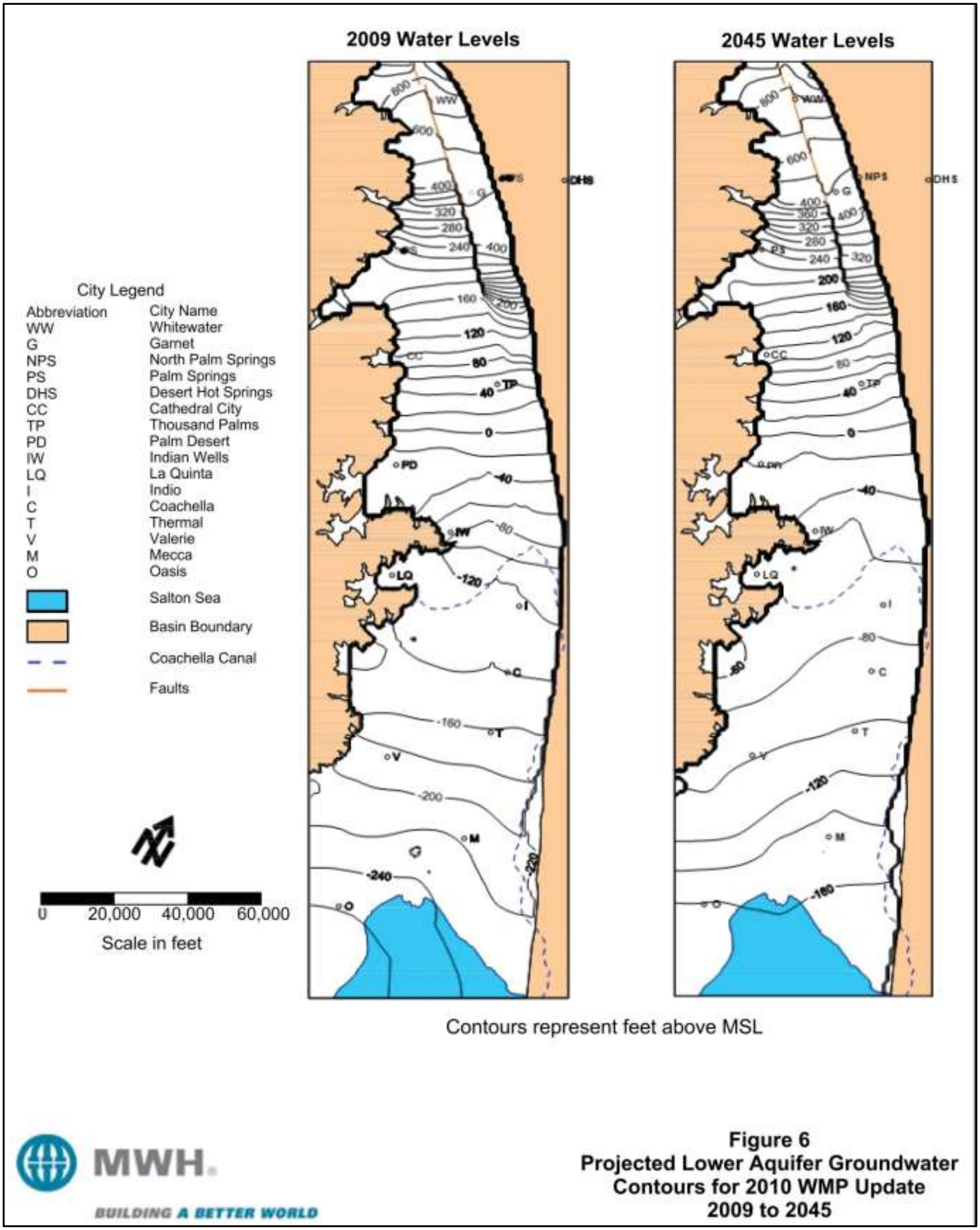

Figure 6
Projected Lower Aquifer Groundwater Contours for 2010 WMP Update
2009 to 2045

CHAPTER VI
REPLENISHMENT ASSESSMENT

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REPLENISHMENT ASSESSMENT

A. State Water Code

Sections 31630 through 31639 of the State Water Code authorize CVWD to levy and collect water replenishment assessments for the purpose of replenishing groundwater supplies within CVWD boundaries. The State Water Code defines production, producer, and minimal pumper for replenishment purposes as follows:

1. "**Production"** or **"produce"** means the extraction of ground water by pumping or any other method within the boundaries of the district or the diversion within the district of surface supplies which naturally replenish the ground water supplies within the district and are used therein.

2. **"Producer"** means any individual, partnership, association or group of individuals, lessee, firm, private corporation, or any public agency or public corporation, including, but not limited to, the CVWD.

3. **"Minimal pumper"** means any producer who produces 25 or fewer AF in any year.

The replenishment assessment is based on groundwater production within the east portion of the Whitewater River Subbasin within the boundaries of CVWD and is limited to the AOB.

Production by minimal pumpers is exempt from assessment. The number of minimal pumpers in the AOB is currently unknown. CVWD has an ongoing program to conduct a thorough field investigation of the use of all wells. Minimal pumpers predominantly pump water from small wells that are used for domestic or limited irrigation purposes.

The State Water Code defines "replenishment assessment" and states that assessments may be levied upon all water production within the AOB, provided the assessment charge is uniform throughout said AOB. The RAC is a monetary charge authorized by the State Water Code and uniformly applied to extractions of groundwater within certain specified geographic boundaries of CVWD for payments of an imported or recycled (reclaimed) water supply purchased to supplement naturally existing water supplies. Charges for the water supply are limited to certain specified costs.

In the initial twelve years of the West Whitewater River Subbasin GRP, only certain portions of the SWP costs could be included in the RAC calculation. However, in 1991 the legislature passed and the governor signed into law AB 1070. This bill allowed additional costs including the cost of importing and recharging water from sources other than the SWP and the cost of treating and distributing recycled water. The RAC considered in this report is based on the most recent and reliable information available with respect to applicable costs or charges.

B. Replenishment Water

Replenishment water for the East Whitewater River Subbasin AOB GRP comes primarily from CVWD's Colorado River water contract and the Quantification Settlement Agreement. Colorado River Water available for groundwater replenishment includes the following block amounts:

Base Allotment		301, 000 AF
1988 MWD/IID Approval Agreement		20,000 AF
IID to CVWD-First Transfer		50,000 AF
IID to CVWD-Second Transfer		53,000 AF
	Total:	**424,000 AF**

Groundwater replenishment water is priced at CVWD's Canal Water Class 3 Rate plus Quagga Mussel and Gate Charges.

The Quantification Settlement Agreement also provided CVWD a transfer from MWD in the amount of 35,000 AF/yr. This SWP water is exchanged for Colorado River Water and can be delivered at Imperial Dam for delivery via the Coachella Canal to the east portion of the Whitewater River Subbasin or can be delivered via the Colorado River Aqueduct for delivery to the west portion of the Whitewater River Subbasin or Mission Creek Subbasin.

C. Replenishment Program Accounting & Replenishment Assessment Development

1. <u>Coachella Valley Water District State Water Project Tax</u>

   In 1959, the voters of California approved and adopted the Burns-Porter Act (The California Water Resources Development Bond Act-Water Code 12930) and in so doing, approved the use of local taxes when a local agency's board of directors determines such use to be necessary to fund that agency's water contract obligations. CVWD's Board of Directors determined that such a tax was necessary to carry out those obligations, which were incurred pursuant to CVWD's long-term plan to eliminate groundwater overdraft through replenishment basins that would benefit the entire Coachella Valley. This property tax has been levied on all property within the CVWD boundary since 1967. On March 12, 2013, the CVWD Board of Directors approved an increase in the property tax from \$0.08/\$100 of assessed valuation to \$0.10/\$100 of assessed valuation effective July 1, 2013.

   A portion of the SWP Tax Revenues is being used to fund the direct and indirect GRP in the East Whitewater River Subbasin AOB.

2. <u>Debt Consolidation</u>

   The East Whitewater Replenishment Fund received a loan from CVWD's Domestic Water Fund to construct the TEL Replenishment Facility in the amount of \$49.2 million. Beginning in 2013, this capital debt is now consolidated with the Uncollected RAC First Four Years and Assessed vs Assessable amortizations from prior years to form one debt service amount and such debt will be paid back each year to the Domestic Water Fund.

3. Income Statement

Table 5 presents the items identified above into an income statement showing Actual Fiscal Year 2014, Projected Fiscal Year 2015 and Projected Fiscal Year 2016 Revenues, Expenses, and Cash Flow. **Table 5** shows that even with the proposed $7/AF RAC increase previously recommended, the reserve balance continues to decline.

The SWP Tax Revenues and debt service payments in the Income Statement were presented in a multi-year forecast at the Joint Water Policy Advisory Committee meeting on March 19, 2015 for the East Whitewater River Subbasin AOB.

Table 5
Coachella Valley Water District
East Whitewater River Subbasin Area of Benefit
Groundwater Replenishment Program Income Statement

Description	Actual Fiscal Year (FY) 2014 ($)	Projected FY 2015 ($)	Projected FY 2016 ($)
Revenues			
RAC Revenue[1]	5,508,000	6,292,000	7,026,000
SWP Tax Revenue[2]	6,511,000	7,539,000	8,417,000
Total Revenues	**12,019,000**	**13,831,000**	**15,443,000**
Expenses			
Total Operation and Maintenance (O&M) Costs[3]	805,000	1,220,000	1,226,000
Power Costs[4]	1,074,000	1,042,000	1,115,000
Colorado River Water[5]	3,450,000	3,654,000	3,650,000
Administrative Costs[6]	1,049,000	1,147,000	1,181,000
Depreciation[7]	397,000	392,000	392,000
Capital Improvement	102,000	39,000	139,000
In-Lieu Replenishment Costs[8]	369,000	700,000	9,821,000
Debt Service[9]	4,203,000	4,328,000	4,349,000
Total Expenses	**11,449,000**	**12,522,000**	**21,873,000**
Increase (Decrease) in Cash Flow - Replenishment	(5,544,000)	(5,838,000)	(14,455,000)
Increase (Decrease) in Cash Flow - SWP	6,511,000	7,539,000	8,417,000
Net Increase (Decrease) in Cash Flow	**1,364,000**	**2,093,000**	**(5,646,000)**
Ending Unrestricted Reserves	**(12,471,000)**	**(18,309,000)**	**(32,764,000)**
Ending Restricted Reserves	**6,511,000**	**14,050,000**	**22,467,000**
Ending Reserves	**(5,960,000)**	**(4,259,000)**	**(10,297,000)**

NOTES:

(1) RAC Revenues for FY 2014 is $45/AF, FY 2015 is $52/AF, and for FY 2016 is $59/AF. Projections are based on prior FY production.

(2) SWP Revenues collected from $.01 tax levy.

(3) O&M costs include labor, equipment, and materials for the replenishment facilities.

(4) Power costs are the actual power and utility charges for the replenishment facilities for FY 2014.

(5) Colorado River water costs for FY 2014 were based on the delivered volume of 37,736 AF. FYs 2015 and 2016 water costs are based on an estimated 40,000 AF. The calculated rate per AF is comprised of CVWD's Class 3 Rate plus Quagga and Gate Charges.

(6) Annual cost to administer the GRP includes personnel, meter reading, investigation, report preparation, and billing.

(7) Depreciation is the annual depreciation expense for the TEL Groundwater Replenishment Facility.

(8) Costs for projects providing recycled water or Colorado River water in place of groundwater.

(9) Debt Service refers to the 15 year variable debt instrument payable to CVWD's Domestic Water Fund in the amount of $60,285,179. This note payable reimburses the Domestic Water Fund for the land and construction costs of the replenishment facilities within this AOB.

D. Methods for Determining Production

In accordance with Section 31638.5 of the California Water Code, Producers who extract greater than 25 AF/Yr, including artesian flowing groundwater, are required to have water-measuring devices installed on all wells or other water producing facilities and report the total amount produced from all wells to CVWD on a monthly basis. Minimal pumpers are exempt from this provision.

Producers shall submit a water production statement on a CVWD approved form with their RAC payment each month or enter into a Water Production Metering Agreement with CVWD to have CVWD staff measure and report groundwater production.

If no statement of production is furnished, CVWD will calculate production based on energy consumption records (in kilowatt-hours) and the results of well pump tests indicating unit energy consumption per AF of production (in kilowatt-hours per AF).

If no energy consumption records are available, CVWD will compute the groundwater pumping based on consumptive use of water. Consumptive use will be computed by multiplying the irrigated acreage for each crop type using CVWD's zanjero maps of cropping patterns (conducted semi-annually) by a water consumption factor for each crop. The water consumption factor will be based on published crop evapotranspiration requirements, an allowance for leaching and an irrigation efficiency of 70 percent. Other water consumption factors will be used to compute production not used for irrigation. Production will be computed by subtracting any metered deliveries of Canal water or recycled water.

If the total metered, estimated or computed annual amount of production for any producer is 25 AF or less, that entity will be designated a minimal pumper and will be exempt from the RAC for that year. Minimal pumpers will be re-evaluated as necessary.

E. Replenishment Assessment Charge

The Joint Water Policy Advisory Committee has previously recommended a RAC increase of $7/AF per year for successive fiscal years beginning July 1, 2009. This would increase the RAC from the current $52/AF to $59/AF effective July 1, 2015 for a 13.5 percent increase.

Based on projected revenue as shown on **Table 5**, the propose RAC increase results in a projected decrease in cash flow in fiscal year 2016 in the amount of $5.6 million.

CHAPTER VII
CONCLUSION AND RECOMMENDATION

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Because the groundwater production from the East Whitewater River Subbasin AOB continues to exceed the natural inflow, the GRP must continue importing water for groundwater replenishment.

The GRP has proven to be effective in reducing groundwater overdraft. However, GRP costs continue to increase. CVWD has analyzed projected expenses, revenues, and reserves over the next five years and determined that the RAC set forth herein is needed to sustain the GRP.

Accordingly, it is recommended that the RAC of $59.00/AF be levied upon all producers within the AOB in accordance with the State Water Code, effective July 1, 2015.

CHAPTER VIII
BIBLIOGRAPHY

BIBLIOGRAPHY

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