WEST COACHELLA VALLEY

NITRATE ASSESSMENT

STATUS REPORT

Prepared By

Cathy L. Sanford, PG

California Regional Water Quality Control Board
Colorado River Basin Region

February 2018

Table of Contents

I. EXECUTIVE SUMMARY 2
II. INTRODUCTION 5
III. GEOLOGY/HYDROGEOLOGY 5
Coachella Valley Geology/Hydrogeology 5
Indio Groundwater Subbasin Geology/Hydrogeology 6
IV. SEPTIC SYSTEMS IN WEST COACHELLA VALLEY 6
V. CENTERALIZED SEWER SYSTEMS IN WEST COACHELLA VALLEY 7
VI. CENTRALIZED SEWER COLLECTION LEAKS IN WEST COACHELLA VALLEY 9
VII. LAND USE RELATED IMPACTS IN WEST COACHELLA VALLEY 10
1938 – 1957 11
1958 – 1977 11
1978 – 1997 12
1998 – 2017 12
VIII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 15
IX. REFERENCES 17
X. Appendix A 19
FIGURES 19
TABLES 19
ATTACHMENTS 19

I. EXECUTIVE SUMMARY

Regional Water Board staff evaluated the distribution and potential sources of elevated nitrate concentrations in groundwater in the west Coachella Valley. This status report presents an assessment of data gathered to-date for the western portion of the Indio Subbasin (study area), specifically Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, and Indian Wells. The assessment included:

- Evaluation of geologic factors related to contaminant risk,
- Review of historical land uses,
- Evaluation of septic and centralized sewer system availability,
- Identification of sewer system overflows,
- Review of nitrate concentrations in groundwater through time, and
- Evaluation of nitrate sources based on the presence of chemicals indicative of either wastewater or agricultural activities.

The findings to-date are summarized as follows:

1. The study area is underlain by unconsolidated alluvium, wind-blown sand, and river channel deposits that are permeable and readily transmit contaminants to groundwater. The study area has been identified as a nitrate high-risk area by the State Water Board.

2. The study area has been urbanized since the 1930's. The first public centralized sewer systems to service the urban area began operating in Palm Springs in 1960 and in Palm Desert in 1972. Septic tanks were used prior to the availability of the sewer systems.

3. Many medium to high-density housing and occupancy buildings (e.g., condominium complexes, mobile home trailer parks, hotels, etc.) in the study area still use septic systems for wastewater disposal. The number of single homes using septic systems could be in the thousands. Staff are working to quantify the type and number of housing developments using septic systems in the study area.

4. All of the municipalities in the study area have ordinances requiring connection to a centralized sewer system for new and existing buildings. Residences and business using septic systems are required to connect to the centralized system when one is available [in close proximity], and connection is feasible. The municipalities grant exemptions to sewer system connections under certain conditions.

5. Leaks from the sewer collection system are considered a risk to groundwater, but are difficult to identify. Subsurface releases from leaking sewer pipelines have been reported in the study area. Surface spills of wastewater from the sewer collection system were generally small and are not considered a significant threat to overall water quality.

6. Chemicals associated with irrigated golf courses and past agricultural activities, such as pesticides, herbicides, and fertilizers have been detected in groundwater in association with some elevated nitrate levels. Chemicals associated with domestic wastewater, such as pharmaceuticals and personal care products (PPCPs) have also been detected in groundwater in association with some elevated nitrate levels. Sources of domestic wastewater include septic tanks, wastewater treatment plants, and leaking sewage collection systems. Elevated nitrate concentrations appear to be associated with both agricultural (golf course) activities and domestic wastewater, however the relative contribution from these two potential sources is not known at this time.

7. Nitrate concentrations exceeding the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L as Nitrogen) for drinking water occur in the study area. These high nitrate areas are associated with various anthropogenic sources including legacy septic tanks, historic agricultural use, golf courses, and treated and untreated wastewater discharges from centralized sewer collection systems. Some of the elevated concentrations date to the 1930s.

8. Data regarding nitrate concentrations through time are limited. Wells with high nitrate concentrations appear to be removed from service, and routine monitoring.

Recommended actions for the Regional Water Board:

- Develop and maintain a database to manage/maintain information regarding the number, location, and types of septic systems in the study area, as well as system failure rates, and operation and maintenance. This is essential to develop and implement water quality control policy to address the threat from the septic systems.

- Continue to assist the wastewater districts and municipalities to secure financial assistance to phase out septic tanks.

- Request wastewater districts provide key information on the their sewer collection systems, including:
    - Specifications (age, length, type of pipe material, etc.) for mains, trunks, collectors, sub-collectors, interceptors, branches, etc;
    - Typical annual operation and maintenance of the system;
    - Surveys and inspection results of system integrity,
    - Percentage of collection system surveyed/inspected for potential leaks in the past 10 years; and

  - Criteria used to determine what section(s) of the system should be surveyed/inspected and when (e.g., age of pipe, type of pipe, resources, etc.).

- Continue this nitrate evaluation program, and establish an in-house basin-wide groundwater assessment program to holistically evaluate the risk posed by nitrates. This requires developing a database of water quality information, and requests to various stakeholders to share water quality data, with the objective of evaluating data from a water-protection point of view. This on-going study provides an opportunity to consider other lines of evidence linking elevated nitrate concentrations to specific sources.

- Evaluate the relative contribution of potential nitrate sources (septic systems, sewer collection system leakage, and golf course/landscaping irrigation), and assess actions needed to reduce nitrate loading from these sources.

The proposed in-house evaluation is a continuation of the evaluation program this status report describes. The limited availability of groundwater chemistry data, and related factors, such as depth of well-screened intervals, place constraints on this evaluation. Given the above, all findings and conclusions in this status report should be considered preliminary.

II. INTRODUCTION

Groundwater is the sole source of drinking water in the Coachella Valley and is subject to increasing demands. Nitrate impacts to groundwater is a statewide and local concern. In 2013, State Water Board released an Issue Paper: *Determining Nitrate High-Risk Areas* (SB, 2013), which are identified as hydrologically vulnerable areas, high use groundwater basins, and areas with wells reporting nitrate concentrations above the MCL.

- Figure II-A[1] shows hydrologically vulnerable areas and high use groundwater basins in California;
- Figure II-B shows a close up of the Coachella Valley; and
- Figure II-C shows nitrate high-risk areas in California, including the central portion of the Coachella Valley.

As part of the 2014 Basin Plan Triennial Review, this Regional Water Board identified nitrate impacts to groundwater from septic system wastewater discharge within Coachella Valley as one of five priority issues for review and/or update. Regional Water Board staff prepared and submitted a work plan to the Regional Water Board proposing to conduct groundwater studies in areas of Coachella Valley with higher nitrate concentrations, identify potential sources of nitrates from land use activities, and propose a plan of action to address the findings (see Attachment II-A).

Geologic/hydrologic, land use, and groundwater data, from 1936 through 2017 was evaluated for the western portion of Coachella Valley including the cities of Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, and Indian Wells. Correlations were considered between nitrate impacts to groundwater and the most likely sources of nitrate (inadequate/failed septic systems, sewer pipeline leaks, wastewater treatment plants, and wastewater from landscaped areas and golf courses). This report presents the findings to-date of this assessment and provides preliminary recommendations to the Regional Water Board to address the impacts.

III. GEOLOGY/HYDROGEOLOGY

Coachella Valley Geology/Hydrogeology

Coachella Valley lies in the northwestern portion of the Salton Trough, which extends from the Gulf of California in Mexico northwesterly to the Cabazon area. The Basin is bounded on the north and east by crystalline bedrock of the San Bernardino and Little San Bernardino Mountains and on the west by the crystalline rocks of the Santa Rosa and San Jacinto Mountains. Geologic faults and structures generally divide the Coachella Valley Groundwater Basin into four subbasins: Indio (Whitewater), Garnet Hill, Mission Creek, and Desert Hot Springs (DWR Bulletin 118, 2004). Figure III-A, obtained from the Coachella Valley Salt Nutrient Management Plan, shows the general geology of the Coachella Valley area.

[1] Figures, Tables, and Attachments referenced in this report are in identified and included in Appendix A.

Indio Groundwater Subbasin Geology/Hydrogeology

The study area focuses on the western half of the Indio Groundwater Subbasin in the Coachella Valley, which is considered a high use priority basin by the State. Large portions of the Indio Subbasin include high permeability river channel deposits and alluvial fans with rapid infiltration zones. These geologic conditions allow groundwater recharge at rates substantially higher than in lower permeability or confined areas of the Coachella Valley, making groundwater more vulnerable and susceptible to contamination from surface or shallow subsurface discharges of wastes.

The primary aquifer in the Indio Subbasin is unconsolidated Pleistocene-Holocene valley fill. Groundwater recharge is primarily runoff from the surrounding mountains, local precipitation, irrigation return flows (in the eastern portion of the Indio Subbasin), stream flow from the Whitewater River and other rivers and creeks, and infiltration of imported Colorado River water supplied to spreading grounds at several location within the Coachella Valley. Groundwater discharge is primarily through extraction by pumping wells, but a portion is lost through evapotranspiration and underflow to the Salton Sea and Imperial Valley areas. The groundwater flow direction is toward the southeast in the direction of the Salton Sea.

IV. SEPTIC SYSTEMS IN WEST COACHELLA VALLEY

Septic systems are useful and necessary for households that are not near a centralized sewage collection and treatment system. However, the use of septic systems does not always translate into adequate protection of water quality. Septic systems may not adequately treat and dispose of waste due to poor design, inadequate operation and maintenance, or site-specific conditions. Even with proper design, and operation and maintenance, research indicates septic systems are a leading cause of groundwater pollution in the United States. Further, in areas with high densities of septic systems, the systems may discharge wastes in quantities that exceed the assimilative capacity of subsurface soils[2] and groundwater.

Regional Water Board staff reviewed the municipal codes for each city in western Coachella Valley to evaluate how septic systems are managed within their jurisdictions. All of the municipalities in the study area require new buildings to connect to available centralized sewer systems. Connection to sewer systems is also required for older buildings when certain triggering events occur, such as the transfer of ownership. Under a variety of conditions, each city allows temporary exemptions to the required sewer connection, such as the lack of availability of a centralized sewer system, or where the cost of connecting is excessive due to site-specific conditions. Additionally, the municipalities may allow septic systems to remain in use if they are less than 20 years old, function adequately, and have no failures. In the case of condominiums and trailer parks, connecting to the centralized sewer system upon transfer of ownership may not be required if the unit shares a septic system with other units in the same facility. Some of

[2] Certain soils can remove some constituents of concern associated with discharges of wastes from septic systems (e.g., bacteria).

the exempted properties are located in the out-lying areas of the cities along mountain fronts and the Whitewater River, where high permeability soils and rapid infiltration rates makes the aquifer more susceptible to contaminants.

The presence of septic systems serving medium to high density residential areas appears to pose a significant risk to groundwater quality due to the potential for nitrate discharge rates to exceed assimilative capacity of the groundwater under those properties. More information is needed regarding septic system age, failure rates, maintenance practices, and the prevalence of temporary connection exemptions to evaluate the degree of risk posed by these systems. This information should be develop by the cities in response to either the State of California *Water Quality Control Policy for Siting, Design, Operation and Maintenance of Onsite Wastewater Treatment Systems* (SB-Res 2012-0032) or pursuant to Section 13267 of the California Water Code.

As the next step in this evaluation, additional information regarding septic system use was requested from the cities located in western Coachella Valley. An example of the request is provided in Attachment IV-A, and a list of the cities receiving the request in Attachment IV-B. That information will be evaluated as it is received.

V. CENTERALIZED SEWER SYSTEMS IN WEST COACHELLA VALLEY

To evaluate potential nitrate impacts to groundwater from sanitary sewer systems, Regional Water Board staff:

1. Reviewed centralized sewer system infrastructure plans for cities within western Coachella Valley obtained from the Palm Springs Water District, Valley Sanitary District, Coachella Valley Water District, and Desert Water Agency,
2. Determined where sanitary sewer systems are available, and
3. Assessed where septic system may still be in use.

Figure V-A was generated to illustrate areas in west Coachella Valley without a centralized sewer system. Areas delineated in blue are undeveloped graded lots without access to a sewer system while areas delineated in red are developed areas without access to a sewer system, likely to have septic systems.

The following table (Table V-A) provides additional information for each of the developed areas identified in Figure V-A, that are without access to a centralized sewer system. Septic systems are assumed to be in use in these areas. Table V-A categorizes potential septic use areas as: hydrologically vulnerable, servicing medium or high density housing, and other features such as low density housing, hotels, or commercial/industrial areas. Some properties fall into more than one category.

Table V-A
West Coachella Valley Areas Without Sewer System Infrastructure

City/ WD	Hydrologically Vulnerable	Medium – High Density	Other Conditions
Palm Springs/ PSWD & DWA	1] Condos-IndCny/SanRafael 2] Trailers-SanRafael/McCarthy Trailers-Twinstar/Blue Mtn Rd 3] Trailers-GoldensandsDr 4] Condos- at Chino Canyon 5] Condos-Vista Las Palmas 10] SE Palm Cny/Sunrise Wy 11] Trailer Parks 12] Trailer Parks 13] Indian Canyon	1] Condos-IndCny/SanRafael 2] Trailers-San Rafael/McCarthy Trailers-Twinstar/Blue Mtn Rd 3] trailer park-GoldensandsDr 4] Condos-at Chino Canyon 5] Condos-Vista Las Palmas 7] Condos-Alejo/Sunrise 8] West end Tahquitz Canyon Wy 9] Housing-Ramon Rd 10] SE Palm Canyon/Sunrise Wy 11] Trailer Parks 12] Trailer Parks 13] Indian Canyon	6] Riviera Hotel
Cathedral City/ CVWD & DWA		14] Housing 15] Downtown redevelopment 16] SE Dinah Shore/Date Palm	
Rancho Mirage/ CVWD	19] Bradley Canyon/ Thunderbird Cove	18] Housing [Sec 30]	17] Commercial Area Costco/HmDepot
Palm Desert / CVWD	27] Communities- SE of El Paseo/ Hwy 74 28] Cahuilla Hills 29] Silver Spur Mobile Manor	20] Housing Under Development some Vacant Lots 21] Housing 23] Condos-Cntry Club/Sandpiper 26] Housing-Hovely/ Washington 27] Communities- SE of El Paseo/ Hwy 74 29] Silver Spur Mobile Manor	22] Low Density Housing 24] Industrial/Commercial 25] Low Density Housing ½ Toscano CC
Indian Wells/ CVWD	30] East ½ Vintage CC part of Sandpiper Drive 31] Housing- Elkhorn Tr/Miles	31] Housing- Elkhorn Trail/Miles	

56] Correlates to numbered Red Square Areas on Figure V-A showing areas without centralized sewer systems
WD = Water District
PSWD = Palm Springs Water District
DWA = Desert Water Agency
CVWD = Coachella Valley Water District

As Figure V-A and Table V-A indicates there are over 20 medium to high density housing areas in west Coachella Valley using septic systems, and many of these properties are located in hydrologically sensitive areas. The use of septic systems in hydrologically sensitive areas with high population density is potentially a significant source of nitrate in groundwater. Further investigation regarding this issue appears warranted.

VI. CENTRALIZED SEWER COLLECTION LEAKS IN WEST COACHELLA VALLEY

A leaking sewer system is a potential source of nitrate impact to groundwater. Two types of leaks are possible: sudden leaks from broken and collapsed pipes; and long-term leaks from pipe joints or pipe perforations (e.g., perforations caused by root intrusion or pipe deterioration). Periodic evaluation of the integrity of a sewer collection system is a standard component of the overall Operation and Maintenance Plan for the system; otherwise leaks can go undetected or unnoticed for years, and adversely impact water quality. Leaks from collapsed or broken pipelines may result in sewage overflows, which are easier to detect and quantify because they generally occur at the ground surface.

The State of California maintains the California Integrated Water Quality System (CIWQS) database, which contains information regarding sanitary sewer overflows (SSO). The causes of these reported SSOs include pipe damage or failure, intrusive roots, and other factors. These spills have the potential to adversely impact groundwater quality.

The SSO reports identify three categories of untreated or partially treated wastewater spills resulting from a sanitary sewer system failure or flow condition:

> **Category 1:** Discharges of any volume that reach surface water and/or a drainage channel tributary to a surface water; or a municipal separate storm sewer system and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly.
>
> **Category 2:** Discharges of 1,000 gallons or greater that do not reach surface water, a drainage channel, or a municipal separate storm sewer system unless the entire SSO discharged to the storm drain system is fully recovered and disposed of properly.
>
> **Category 3:** All other discharges of untreated or partially treated wastewater resulting from an enrollee's sanitary sewer system failure or flow condition.

Category 3 spills are the only spills likely to affect a significant volume of groundwater. Staff reviewed SSO reports for west Coachella Valley for the 10 year period from August 10, 2008 to August 10, 2017. The map of SSOs from the CIWQS database is provided as Figure VI-A. Figure VI-B, generated by staff, illustrates SSOs caused by infrastructure malfunction or failure in west Coachella Valley.

For the 10 year period reviewed, a total of 9 Category 1, 6 Category 2, and 25 Category 3 spills were reported. Twenty-Five of these 40 spills were the result of infrastructure malfunction or failure, or were unknown. Results are summarized in Tables VI-A for Category 1, Table VI-B for Category 2, and Table VI-C for Category 3 SSOs. The volume of released waste was generally small, with a few notable exceptions. Regional Water Board staff has responded and addressed these spills, and it is the opinion of staff that these overflows are not likely related to the nitrate impacts observed in groundwater.

Based on the foregoing, the potential for adverse impacts to groundwater from long-term leaks needs further evaluation.

VII. LAND USE RELATED IMPACTS IN WEST COACHELLA VALLEY

To evaluate other potential anthropogenic sources of nitrate impacts to groundwater, Regional Water Board staff compared historic land uses with elevated nitrate concentrations in groundwater over time. Information on the history of west Coachella Valley population centers, population densities, agriculture and evolving commerce, were obtained from on-line sources. Staff also reviewed the State Water Board's Groundwater Ambient Monitoring & Assessment (GAMA) Program database, which contains chemical analysis data for a limited number of wells and constituents in the study area.

Information on the history of west Coachella Valley since the 1930's was compared to groundwater analytical data for the same time periods to evaluate potential anthropogenic sources of nitrate impacts to groundwater. The data indicates that early land use consisted of sporadic agriculture, with significant urban centers forming since the 1930's. Along with population growth, land uses related to community services [business districts, schools] and recreation/commercial purposes [golf courses, parks, agriculture] were established and expanded.

A map of Coachella Valley obtained from Coachella Valley Water District displays land use of the Indio Subbasin in 2005 (Figure VII-A). As shown, the west portion of the Valley was primarily urban, with sporadic open space/recreational around Palm Springs and Cathedral City and primarily urban with large segments of open space/recreational (golf courses) in the central portion of the Valley (Rancho Mirage, Palm Desert, and Indian Wells).

Four era-specific maps were prepared based on the on-line USGS database that show population centers and historic agricultural areas (Figures VII-B through VII-E). Regional Board staff added graphics to the maps to illustrate golf course development, and nitrate levels in groundwater for 20-year periods, ranging from 1938 to 2017. Wells reporting nitrate in groundwater are represented on the maps as green, blue, yellow, and red circles, signifying the maximum nitrate concentrations for that specific well sampled during the 20-year period represented by the map.

- Wells coded green = nitrates below detection level,
- Wells coded blue = nitrate concentrations less than 5 mg/L,
- Wells coded yellow = nitrate concentrations from 5 to 10 mg/L, and
- Wells coded red = nitrate concentrations above the MCL of 10 mg/L.

Groundwater analytical data in GAMA from 1984 were also reviewed for indicators of nitrate sources in groundwater:

- The presence of pharmaceutical chemicals, disinfectants, wastewater treatment chemicals, and foaming agents were assumed to indicate domestic wastewater influence.
- The presence of herbicides, pesticides, and fertilizers were assumed to indicate agriculture or golf course influence.

The presence of these indicator chemicals in groundwater are represented on the maps (Figures VII-D and VII-E) by '**S'** for wells reporting constituents associated with domestic wastewater and by "**Ag**" for wells indicating influence from herbicides, pesticides, and fertilizers. A list of the indicator chemicals detected in groundwater in west Coachella Valley is provided as Attachment VII-A. Each 20-year period from 1938 to 2017 is discussed below:

1938 – 1957

The city of Palm Springs was incorporated in 1938, and the areas that would later become Cathedral City, Rancho Mirage, Palm Desert, and Indian Wells consisted of small unincorporated population centers with the beginnings of commerce, community services, agriculture, recreation [8 golf courses, tennis/racquet ball clubs], and open space landscaped areas. Seasonal residents often outnumbered year round residents in the Coachella Valley. All residents and businesses used septic systems.

As Figure VII-B illustrates, nitrate concentrations were generally low as indicated by the green and blue well locations. Higher nitrate concentrations were found in Rancho Mirage near the Tamarisk Country Club, and in Indian Wells near the Indian Wells Golf Resort and historic agricultural areas.

Two areas reported nitrate concentrations in groundwater greater than 10 mg/L:

- Rancho Mirage community near Thunderbird Country Club, and
- Agricultural areas northeast and east of the Palm Desert community.

A 1948 report published by the University of California, Berkeley, hypothesized that elevated nitrate concentrations near Palm Desert was due to agricultural irrigation water flushing nitrates from soil, and that those nitrates were originally associated with a natural mesquite forest (UCB, 1948). This is considered an agricultural impact because irrigation water mobilized the nitrates to groundwater.

1958 – 1977

The 1960's and 1970's were periods of rapid year-round population growth in the west Coachella Valley. Commercial endeavors focused on recreation such as hotels, tennis clubs and golfing. Golf courses pre-dominated the central Coachella Valley commerce and continued to multiply. The cities of Indian Wells in 1967, Rancho Mirage in 1973, and Palm Desert in 1973 were incorporated. The Palm Springs Wastewater Treatment Plant began servicing areas of Palm Springs in1972. The Palm Desert Country Club began use of a wastewater treatment system in 1962, using the treated water to irrigate the golf course. In 1972, Coachella Valley Water District opened the wastewater treatment plant known as WRP 10, servicing the Palm Desert area. Wastewater treatment plants are shown on Figure VII-C. Except for the residents and businesses served by the centralized sewer systems in Palm Springs and Palm Desert, all others in the west Coachella Valley continued to use septic systems.

Figure VII-C shows groundwater data for commercial and urban areas in the west Coachella Valley. Groundwater generally shows low nitrate levels, as represented by the green and blue well locations. Areas of Palm Springs, Cathedral City, Rancho Mirage, and Palm Desert report increasing nitrate concentrations as represented by the yellow well locations.

Nitrate concentrations greater than 10 mg/L (red wells) were identified in the following areas:

- North Rancho Mirage near The Springs and Tamarisk Country Clubs,
- Rancho Mirage in Bradley Canyon-Thunderbird Cove,
- Rancho Mirage in Magnesia Falls Canyon,
- North Palm Desert south of the Palm Desert Greens Golf Course,
- South Palm Desert along the mountain front,
- Northeast-East of the Palm Desert population center, and
- Indian Wells near Indian Wells Country Club.

1978 – 1997

During this period, the year-round population of west Coachella Valley continued to grow. The establishment of golf courses continued to dominate recreational commerce in the study area. Residents and businesses were increasingly connected to the centralized sanitary sewer system in lieu of septic system use.

As Figure VII-D illustrates, generally good water quality was reported throughout the west Coachella Valley as represented by the blue wells. However, groundwater data may underrepresent some of the urban areas, because many regions previously reporting nitrate concentrations above the MCL of 10 mg/L were not sampled during this period. Areas of Palm Springs, Cathedral City, Rancho Mirage, and Palm Desert continued to report elevated nitrate concentrations (yellow wells).

Nitrate concentrations greater than 10 mg/L (red wells) were identified in the following areas:

- North-Northeast Palm Desert,
- South Palm Desert along the mountain front,
- Rancho Mirage near Thunderbird Country Club and other golf courses, and
- Southeast Palm Springs adjacent to the Wastewater Treatment Plant.

During this period, analyses for the presence of chemicals associated with both domestic wastewater and herbicides/pesticides/fertilizers began to be conducted in west Coachella Valley and reported in GAMA. Constituents indicating domestic wastewater influence were detected throughout the west Coachella Valley as represented by **"S"** on Figure VII-D. Chemicals indicating herbicides/pesticides/fertilizers were detected in Cathedral City, Rancho Mirage, Palm Desert, and Indian Wells, as represented by **"Ag"** on Figure VII-D. Note that the Ag indicator chemicals were primarily located near golf courses. In general, more domestic wastewater influences were reported.

1998 – 2017

By 2014, population had grown to approximately 45,000 residents in Palm Springs, 63,000 full time residents in Cathedral City, 17,218 full time residents in Rancho Mirage (and a seasonal population greater than 20,000), approximately 60,000 full time residents in Palm Desert, and more than 5,000 full time residents in Indian Wells (nearly doubling in the winter months). Reportedly, about 125 golf courses are currently located in the Coachella Valley. Centralized

sewer system use continued to expand during this period, and as shown on Figure V-A, only a limited number of households and businesses currently use septic systems.

Figure VII-E shows groundwater data for this period. The data are limited, and many of the areas that previously reported nitrate concentrations above the MCL do not appear to have been sampled during this time period. Areas of Palm Springs, Cathedral City, Rancho Mirage, and Palm Desert reported a greater number of wells with elevated nitrate concentrations (yellow wells).

Nitrate concentrations greater than 10 mg/L (red wells) were identified in the following areas:

- South Palm Springs near Tahquitz Creek Golf Resort and other Golf Courses,
- Southeast Palm Springs adjacent to the Wastewater Treatment Plant,
- Cathedral City near the Date Palm Country Club at the end of the Cove,
- North-Northeast Palm Desert – near WRP 10 and golf courses, and
- South Palm Desert along the mountain front.

Domestic wastewater influence were indicated in numerous areas. Herbicide/pesticide/fertilizer indicators were present in the south and southeast portion of Palm Springs along the mountain fronts in the vicinity of golf courses. These suggest both domestic wastewater and herbicide/pesticide/fertilizer influences, with more domestic wastewater influences noted.

Summaries of population growth, evolving commerce (golf courses), and nitrate impacts to groundwater from anthropogenic sources for each city in west Coachella Valley are discussed below.

Palm Springs—As Figures VII-B through VII-E illustrate, nitrate concentrations in groundwater remain generally low in the northwest portion of Coachella Valley, where agriculture or golf courses do not dominate land use. Palm Springs established sewer system infrastructure and initiated wastewater treatment in 1960, and was the first community in Coachella Valley to do so. Elevated nitrate concentrations in groundwater were first reported in the 1958-1977 period in the central portion of the Palm Springs urban area, expanding over time to include the northern urban area, and to the southeast in the vicinity of the wastewater treatment plant. Concentrations of nitrates in groundwater above the MCL of 10 mg/L were detected in Palm Springs area wells near the wastewater treatment plant, and Mesquite Golf Course.

As Figures VII-D and VII-E show, chemicals typically associated with domestic wastewater were detected in groundwater throughout Palm Springs, with the area near Ramon Road and Indian Canyon Boulevard reporting elevated nitrate and other wastewater constituents. Analyses of groundwater from the southern area of Palm Springs by golf courses located near Murray Canyon detected pesticides and fertilizers. As shown on Figure VII-F, many areas in Palm Springs still have residences and businesses that use septic systems. Areas near the urban center have reported elevated nitrates in groundwater. Analyses of groundwater from one well in the area of SSO #2 (Figure VII-F and Table VI-C) detected chemicals associated with domestic wastewater.

Cathedral City—There is limited groundwater analytical data for historic [1938-1957] and recent years [1978-2017] in the area of Cathedral City, as shown on Figures VII-B through VII-E. Available

groundwater data generally show low nitrate concentrations in the northern portion of the city, and elevated nitrate concentrations near the Cove. One well, located near Date Palm Country Club, had a nitrate concentration above 10 mg/L, in a hydrologically sensitive area where golf courses are established and septic systems in use until about 2010. Both domestic wastewater indicators, and pesticides/fertilizers were detected in association with elevated nitrate concentrations in Cathedral City. Most of downtown still relies on septic systems, however elevated nitrate detections in this area were limited, probably due to sparse data. No domestic wastewater indicator chemicals were detected in the area of SSO #1 (Figure VII-F and Table VI-C).

Rancho Mirage—Limited analytical data were available for the city of Rancho Mirage for both historic [1938-1957] and recent years [1978-2017], as shown on Figures VII-B through VII-E. Available groundwater data generally indicate low nitrate concentrations in groundwater. Elevated levels of nitrate were detected in the central and southern parts of Rancho Mirage, in the vicinity of Tamarisk and Thunderbird Country Clubs. Wells located near the Thunderbird Country Club, Thunderbird Cove, Tamarisk and Springs Golf Courses, and Magnesia Spring Canyon reported nitrate concentrations above 10 mg/L. Both domestic wastewater indicators and pesticides/fertilizers were detected in areas reporting elevated nitrate levels (Figures VII-D and VII-E). Most of Rancho Mirage is connected to the centralized sewer system, however Thunderbird Cove (Bradley Canyon) uses septic systems for wastewater disposal, is located in a hydrologically sensitive area, and reported nitrate concentrations above 10 mg/L. Domestic wastewater indicators were not detected in the area of SSO #17 or #18 (Figure VII-F and Table VI-C).

Palm Desert—The City of Palm Desert, located in the central portion of Coachella Valley, has significant nitrate impact to groundwater. As Figures VII-B through VII-E illustrate, areas of elevated nitrate were initially reported near the center and to the north of the growing urban/commercial area of Palm Desert, and expanded over time. Nitrate concentrations exceeding the MCL of 10 mg/L were first detected in groundwater located north and northeast of the urban center. Groundwater data from subsequent time periods continued to report nitrate levels above 10 mg/L north and northeast of the Palm Desert urban center, expanding to include the city center, and southeast of the city. Nitrate concentrations greater than 10 mg/L were also detected south of the Palm Desert area, in hydrologically sensitive areas where golf courses were established, and to the north where land use is also dominated by golf courses. Nitrates exceeding MCLs were also reported in the vicinity of WRP 10. Both domestic wastewater indicators, and herbicide/pesticide/fertilizer detections occurred in Palm Desert areas reporting elevated nitrate concentrations in groundwater (Figures VII-D and VII-E). Most of Palm Desert is serviced by a centralized public sewer system. However, locations without sewer system connections include medium to high density housing in hydrologically sensitive areas of Deep Canyon, and low to medium population density areas in the vicinity golf courses. Domestic wastewater indicators occurred in groundwater in the area of SSO #12, #16 and #20 (Figure VII-F, Tables VI-A, VI-B and VI-C). SSO #16 and #20 are located near wastewater treatment plant WRP10, and SSO #12 is located down-gradient of WRP10.

Indian Wells—Indian Wells is a relatively small foothill community located in the south-central portion of Coachella Valley. Historic groundwater data reported low nitrate concentrations in some areas, with areas near large agricultural developments and golf courses reporting elevated nitrate concentrations. Nitrate detections in groundwater near agriculture and golf courses were above the MCL of 10 mg/L for most time periods evaluated. Both domestic wastewater indicator chemicals and pesticides/fertilizers were detected in areas of Indian Wells reporting elevated nitrate concentrations in groundwater (Figures VII-D and VII-E). Most of Indian Wells is serviced by a centralized sewer system, with a small community of low to medium density housing the only area without sewer system connections. Domestic wastewater indicator chemicals were detected in the area of SSO #12 (Figure VII-F, Table VI-A).

In summary, nitrates have been detected at numerous locations throughout the western Coachella Valley over a long period of time. Chemicals associated with both domestic wastewater, and pesticides and fertilizers have been detected in association with elevated nitrate concentrations. This data suggests that elevated nitrates in groundwater are likely associated with both domestic wastewater, and irrigation/landscaping/golf course developments. Further investigation is warranted to better quantify the relative contribution of potential nitrate sources in groundwater, and evaluate actions to mitigate/eliminate impacts.

VIII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Indio Groundwater Subbasin of Coachella Valley is a high use groundwater basin. Due to geologic characteristics, many areas of this Subbasin are considered hydrologically vulnerable to nitrate contamination.

The west Coachella Valley was urbanized in the 1930's, using septic systems for wastewater disposal. Centralized sewer collection and treatment systems began operating in Palm Springs in 1960, and in Palm Desert in 1972. Currently, most of Coachella Valley is serviced by community sewer systems, however septic system use continues in various areas throughout the Indio Subbasin. Commercial endeavors in Coachella Valley have focused around recreational activities including hotels, clubs, golf courses, and more recently festivals.

Nitrate concentrations exceeding the MCL of 10 mg/L occur in the study area. These high nitrate areas appear to be associated with (1) discharges of domestic wastewater, (2) landscaping/golf course activities due to pesticide and fertilizer use, and (3) prior agricultural practices in the area. Insufficient data are currently available to evaluate the relative contribution of these sources, or identify whether the domestic wastewater is from septic tanks or leaking centralized wastewater systems. Staff recommend additional data be collected and evaluated to address this issue. Nitrate impacts to groundwater detected in the vicinity of the wastewater treatment plants is likely associated with operations at those facilities, and are currently addressed through waste discharge requirements (WDRs).

Given the hydrologically vulnerable areas prevalent throughout Coachella Valley, Regional Water Board staff recommends that septic system use be phased out in the urban areas of the west Coachella Valley. In the interim, staff recommends working with local entities to support the monitoring and maintenance of onsite wastewater treatment systems (OWTS) to protect groundwater from nitrate impacts.

To evaluate the degree to which sewer collection systems may be leaking raw sewage and contributing nitrate to groundwater, staff recommends that the integrity of the sewer collection system be evaluated. If significant leaks are identified, further action may be necessary to address impaired or aging infrastructure, identify portions of the sewer infrastructure for replacement, or to develop remedial/mitigation plans.

Wastewater districts, water purveyors, municipalities and other key stakeholders are a valuable resource essential for the protection of water quality in Coachella Valley. Staff recommends working cooperatively with these stakeholders to assist with securing financial assistance to address failing/aging septic systems, centralized sewer system infrastructure, or to expand systems to service areas using septic systems.

Staff recommends reaching out to and collaborating with, local municipalities and the Coachella Valley Regional Water Management Group (CVRWMG), which represents most of the water districts in the Coachella Valley, with the goal of formulating a comprehensive, basin-wide groundwater monitoring plan. The monitoring plan may include groundwater sampling at golf courses, along sewer system infrastructure, wastewater treatment plants, in areas with higher density septic system use, and in populated hydrologically sensitive areas. The program should include groundwater sampling for the shallow aquifer, and sampling of wells with known nitrate impacts to facilitate a nitrate trend and source analysis.

To safeguard groundwater quality in the Coachella Valley aquifer, the Regional Water Board may need to exercise its full range of powers, and additional protective measures, based on the level of cooperation from responsible parties to monitor, quantify, and address as necessary, adverse water quality impacts. Potential actions include: establishing more stringent waste discharge requirements; expanding existing or establishing new, waste discharge prohibitions; and requiring cleanup and/or remedial programs in specific areas. Developing a general waste permit for golf course discharges may be warranted, pending further investigation. Finally, given that much of the west Indio Groundwater Subbasin has nitrate levels under 5 mg/L, developing nitrate water quality objectives more stringent than the MCL should be considered where supported by sufficient data.

IX. REFERENCES

Section II

(SB, 2013) Determining Nitrate High-Risk Areas. State of California Water Quality Control Board. August 2013

Section III

(DWR Bulletin 118, 2004) Coachella Valley Groundwater Basin, Indio Subbasin. California Department of Water Resources. February 27, 2004.

Section IV

(SB Res No 2012-0032) Water Quality Control Policy for Siting, Design, Operation and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy). State of California Water Quality Control Board. June 19, 2012.

Cathedral City Municipal Code Title 8

The City of Coachella Municipal Code Title 13

The City of Indio Municipal Code Title V

The City of Indian Wells Municipal Code Title 13

The City of La Quinta Municipal Code Title 13

The City of Palm Desert Municipal Code Title 8

The City of Palm Springs Municipal Code Title 15

The City of Rancho Mirage Municipal Code Title 8

County of Riverside General Plan

Section VI

California Integrated Water Quality System (CIWQS)
http://www.waterboards.ca.gv/water_issues/programs/sso/sso_map/sso_pub.shtml

Section VII

Palm Desert Historical Society

Palm Springs Historical Society

Coachella Valley History
http://www.lonelyplanet.com/usa/california/palm-springs-and-coachella-valley/history
#ixzz4WKdO3iNp

Ground-Water Quality Data in the Coachella Valley Study Unit, 2007: Results from the California GAMA Program 2007. Data Series 373. Dara A. Goldrath, Michael T. Wright, and Kenneth Belitz. United States Department of the Interior / United States Geologic Society. 2009

State of California GeoTracker - GAMA Database. 1936 – 2017

Coachella Valley Golf Courses
https://search.yahoo.com/local/s;_ylt=A0SO8ycszmda2CoA1SlXNyoA;_ylu=X3oDMTEycTFzMTd2BGNvbG8DZ3ExBHBvcwMxBHZ0aWQDQjQ0ODFfMQRzZWMDc2M-?p=golf+courses&addr=Palm+Springs%2C+CA&loc=woeid%3A2467696&fr=yfp-t

(UCB, 1948). M. R. Huberty, A. F. Pillsbury and V. P. Sokoloff. HYDROLOGIC STUDIES IN COACHELLA VALLEY, CALIFORNIA. UNIVERSITY OF CALIFORNIA BERKELEY, CALIFORNIA. June 1948

X. Appendix A

FIGURES

Figure II-A High Use Basins and Hydrogeologically Vulnerable Areas
Figure II-B Coachella Valley High Use Basins and Hydrogeologically Vulnerable Areas
Figure II-C Nitrate High-Risk Areas

Figure III-A Geologic Map of the Coachella Valley
Figure III-B Water Level Profile A-A' 1936 and 1967
Figure III-C Groundwater Level Changes in Combined East and West Whitewater River Subbasin Management Areas: 2006 to 2016

Figure V-A Areas Lacking Sewer System Infrastructure in West Coachella Valley

Figure VI-A Sanitary Sewer Overflows: 08/10/2008 to 08/10/2017
Figure VI-B West Coachella Valley Sanitary Sewer Overflows 2008 - 2017

Figure VII-A 2005 Land Use in the Indio Subbasin
Figure VII-B 1938 – 1957 West Coachella Valley – Land Use & Nitrate Concentrations
Figure VII-C 1958 – 1977 West Coachella Valley - Land Use & Nitrate Concentrations
Figure VII-D 1978 – 1997 West Coachella Valley - Land Use & Nitrate Concentrations
Figure VII-E 1998 – 2017 West Coachella Valley - Land Use & Nitrate Concentrations
Figure VIII-F West Coachella Valley - Correlation of Land Use & Nitrate Concentrations

TABLES

Table V-A West Coachella Valley Areas Without Sewer System Infrastructure

Table VI-A West Coachella Valley Sanitary Sewer Overflows Report Details – Category 1
Table VI-B West Coachella Valley Sanitary Sewer Overflows Report Details – Category 2
Table VI-C West Coachella Valley Sanitary Sewer Overflows Report Details – Category 3

ATTACHMENTS

Attachment II-A Basin Planning Division Workplan Triennial Review Item 3 - Assess Threats to Groundwater Quality From Septic System Wastewater Discharges Within Coachella Valley FY2016-17, RB Staff, July 29, 2016

Attachment IV-A Request for Information – West Coachella Valley Cities

Attachment IV-B Request for Information – Mail List of West Coachella Valley Cities

Attachment VII-A Detected Indicator Chemicals - West Coachella Valley