Except that portion described as follows:

Beginning at the Northeasterly corner of said Lot 133;

Thence Westerly along the Northerly line of said Lot 133, a distance of 561.00 feet to the true point of beginning; thence Southerly and parallel with the Easterly line of said Lot 133, a distance of 343.20 feet; thence Northwesterly in a direct line a distance of 645.00 feet, more or less, to a point on the Northerly line of said Lot 133, distant Westerly thereon 1,122.00 feet from the Northeasterly corner of said Lot 133; thence Easterly along said Northerly line of said Lot 133, a distance of 561.00 feet to the true point of beginning.

Beginning at the Southeast corner of said Lot 133;

Thence North 00°22'45" West on the Easterly line, a distance of 161.12 feet; thence South 44°31'30" West, a distance of 227.22 feet to a point on the South line of said Lot 133; thence North 89°41'15" East, a distance of 160.40 feet, along the South line of said Lot 133 to the point of beginning.

Also except that portion conveyed to the County of Riverside by deed recorded September 4, 1968 as Instrument No. 85681, of Official Records.

Parcel C:

The Southeasterly half of Farm Lot 7 of Lands of San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as per map recorded in Book 8, Page 357 of Maps, Records of San Diego County.

Parcel D:

The Northwesterly Quarter of Farm Lot 9 of Lands of San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as per map recorded in Book 8, Page 357 of maps, Records of San Diego County.

Parcel E:

The North 20 acres of Farm Lot 136 of Lands of San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as per map recorded in Book 8, Page 357 of Maps, Records of San Diego County, California.

Except that portion described as follows:

Beginning at the Northeast corner of said Lot 136;

Thence South 330.80 feet;

Thence West at a right angle, 489.66 feet;

Thence at an angle 476.74 feet to a point, 160.40 feet West of the point of beginning.

Thence East 160.40 feet to the point of beginning.

Also except that portion conveyed to the County of Riverside by deed recorded September 4, 1968 as Instrument No. 85681 of Official Records.

Parcel F:

Farm Lot 129 and that portion of Farm Lot 133 of San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as shown by map on file in Book 8, Page 357, of Maps, Records of San Diego County, California, more particularly described as follows:

Commencing at the Northeasterly corner of said Lot 133;

Thence Westerly along the Northerly line of said Lot 133, a distance of 561 feet to the true point of beginning;

Thence Southerly and parallel with the Easterly line of said Lot 133, a distance of 343.2 feet;

Thence Northwesterly in a direct line a distance of 645 feet more or less, to a point on the Northerly line of said Lot 133, distant Westerly thereon 1122 feet from the Northeasterly corner of said Lot 133; thence Easterly along said Northerly line of said Lot 133, a distance of 561 feet to the true point of beginning.

Except therefrom Parcels 1 through 4 and Lettered Lot (S) "A" through "P" all inclusive of Parcel Map 29447, as shown by map on file in Book 206, Pages 44 through 49 inclusive, of Parcel Maps, Riverside County Records.

Note: Said land is also designated as a "Remainder Parcel" under the parcel map referred to above.

Assessor's Parcel Number: 436-030-001, Acres: 170.71

436-030- 002, Acres: 1.68

436-040-006, Acres: 19.39

436-040-008, Acres: 4.85

436-170-001, Acres: 17.19

Description of Wells:

State Well Number	Popular Name or Reference Description
04S01W20J001S	Record Flyway
04S01W21E002S	C&R Farms North
04S01W20J002S	C&R Farms South

DATED: 12/6, 2012

SAN JACINTO FUND, LLC,
A Colorado Limited Liability Company
By San Jacinto Fund, LP
By AVF Management, LLC
By David E Ramsay
Its Its Member
(Office or Position)

EXHIBIT "C"
TO
STIPULATION FOR ENTRY OF JUDGMENT

ASSIGNMENT OF BASE PRODUCTION RIGHTS
and
ELECTION

Defendant, SAN JACINTO FUND, LLC, a Colorado Limited Liability Company, by San Jacinto Fund, LP, by AVF Management, LLC by David Ramsay, its Member, based on a collective assignment to said defendant of Base Production Rights under the proposed Stipulated Judgment in the amount of 596 acre feet per year collectively for all properties described on Exhibit "B," hereby elect to be classified collectively in these proceedings as

Class "A" Participants X.

Class "B" Participants ____.

(Select one)

DATED: 12/6, 2012

SAN JACINTO FUND, LLC,
A Colorado Limited Liability Company
By San Jacinto Fund LP
By AVF Management, LLC
By David E Ramsay
Its Member
(Office or Position)

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Attorneys for Plaintiff
EASTERN MUNICIPAL WATER DISTRICT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

EASTERN MUNICIPAL WATER DISTRICT, A California Municipal Water District, Plaintiff, vs. CITY OF HEMET; et al., Defendants.	CASE NO.: RIC 1207274 STIPULATION FOR ENTRY OF JUDGMENT

The parties hereto agree and stipulate as follows:

1. The following facts, considerations, and objectives, among others, provide the basis for this Stipulation for Entry of Judgment:

a. On May 16, 2012, the Eastern Municipal Water District commenced this action by filing a Complaint seeking the adjudication of an area within the San Jacinto Valley described in Exhibit "A" to the Complaint on file herein and known as the "Management Area." The Complaint alleges that the groundwater basins underlying the Management Area, to-wit, the Canyon, the San Jacinto Upper Pressure, and the Hemet North and Hemet South Basins are in a

state of overdraft and seeks correction of this condition by the Court through adjudication of certain rights to produce water therefrom.

b. Each of the parties executing this Stipulation has a direct interest in the quantity and quality of groundwater produced from within the Management Area.

c. The safe yield of the basins that comprise the Management Area is approximately 45,000 acre feet per year. For more than five years preceding the filing of the Complaint, the annual safe yield (as defined in Section 1.33 of the proposed Stipulated Judgment) of the groundwater under the Management Area has been exceeded by the total production therefrom, and a state of overdraft has existed continuously for at least five years. Groundwater production during this period has been open, notorious, continuous, adverse, hostile, and under a claim of right.

d. It is generally recognized and accepted that unmanaged downward decline in water levels has severe adverse impacts on the rights of groundwater producers and on water quality, will cause increased pumping lifts and may result in surface land subsidence.

e. It is apparent to the parties that protection of the rights of the parties and of the public interest in maximizing the beneficial use of a limited resource—groundwater supplies—within the Management Area requires the development, imposition and implementation of a physical solution.

2. The parties agree that the physical solution represented by the Water Management Plan set forth in the proposed Stipulated Judgment attached hereto as Exhibit "A," constitutes a fair and equitable basis for protection of the groundwater supply within the Management Area and for satisfaction of groundwater rights within said Management Area and is in furtherance of the mandate of the State Constitution establishing water policy within the State to maximize

beneficial use and avoid waste, and provides due consideration of the public interest and of the environment.

3. The parties agree that jurisdiction over each of the parties has been established by the allegations in the Complaint and that proper service of process of the Summons and Complaint upon each of the defendants has occurred.

4. The parties agree that the proper venue for this matter is the California Superior Court for the County of Riverside. The parties further agree that the Answers on behalf of all defendants appearing in this action have been filed, generally denying all allegations in the Complaint except those expressly admitted.

5. The parties agree that a Judgment in the form attached hereto as Exhibit "A" may be made and entered by the Court binding these stipulating parties in this action. Each Private Pumper defendant signing this Stipulation shall attach to this Stipulation as Exhibit "B," a signed description of said defendant's property within the Management Area, including the acreage thereof; and, as Exhibit "C," the signed form indicating said defendant's election to be classified as a Class "A" or Class "B" Participant.

6. Accordingly, the parties request that the Court hold a hearing to determine whether there is any objection to said proposed Judgment.

7. The parties agree that in the event that the Court is unwilling to enter a final judgment identical to the Judgment attached hereto as Exhibit "A," this Stipulation will have no binding effect upon any of the parties to this Stipulation, and shall be considered null and void. The parties further agree that in the event this Stipulation becomes null and void under this provision, all defendants will have thirty (30) days to file and serve amended responsive pleadings.

8. The parties agree that this Stipulation may be executed in counterparts, each of which will be filed with the Court.

PLAINTIFF:

DATED: ____________, 2012

EASTERN MUNICIPAL WATER DISTRICT

By_______________________________

DEFENDANT:

DATED: ____________, 2012

LAKE HEMET MUNICIPAL WATER DISTRICT

By_______________________________

DEFENDANT:

DATED: ____________, 2012

CITY OF HEMET

By_______________________________

DEFENDANT:

DATED: ____________, 2012

CITY OF SAN JACINTO

By_______________________________

DEFENDANTS/PUMPERS:

DATED: Aug. 1, 2012

SAN JACINTO SPICE RANCH, INC.

By [signature]

~~Stephen~~ Pastor, President
STEVEN

DATED: Aug. 1, 2012

SAN JACINTO SPICE RANCH, INCORPORATED

By [signature]

~~Stephen~~ Pastor, President
STEVEN

EXHIBIT "B"

TO

STIPULATION FOR ENTRY OF JUDGMENT

<u>Description of Defendant's Property and Wells Within the Management Area</u>

Defendants SAN JACINTO SPICE RANCH, INC., by Stephen Pastor, its President, and SAN JACINTO SPICE RANCH, INCORPORATED, by Stephen Pastor, its President, certify that the following is a description of the property and wells owned by said defendants within the Management Area:

<u>Description & Acreage of each Parcel</u>:

All that certain real property situated in the County of Riverside, State of California, described as follows:

Parcel 1:

A portion of the San Jacinto Land Association, as shown by map on file in Book 8 of Maps, Page 357, San Diego County Records, a portion of Olmsted's Subdivision of Tract Vista of the Rancho San Jacinto Viejo as shown by map on file in Book 4 of Maps, Page 261, San Diego County Records, and a portion of the Hot Sulphur Springs Tract as shown by Map on file in Book 14 of Maps, Page 649, San Diego County Records, described as follows:

Beginning at the intersection of the Southeasterly line of said Hot Sulphur Springs Tract Subdivision with the Southwesterly line of the Riverside County Flood Control and Water Conservation District right of way, as said intersection is shown on Record of Survey on file in Book 33, Page 58, of Records of Survey, Riverside County Records; thence South 58°52'32" West along the said Southeasterly line of the Hot Sulphur Springs Tract, 960.89 feet to the most Southerly corner of said Hot Sulphur Springs Tract, 350.33 feet to an intersection with the centerline of Bath Avenue, as said Bath Avenue is shown on said map of Hot Sulphur Springs Tract; thence South 44°46'15" West along the Southwesterly prolongation of said centerline of Bath Avenue, 351.24 feet to an intersection with the West line of Farm Lot 197 of said San Jacinto Land Association; thence North 00°08'48" West along said West line and the Northerly prolongation thereof, 887.71 feet; thence North 89°51'12" East, 1,147.33 feet to an intersection with said Southwesterly line of the Riverside County Flood Control and Water Conservation District right of way; thence South 23°54'32" East along said Southwesterly line, 428.14 feet to the point of beginning.

Excepting therefrom all that portion thereof conveyed to the County of Riverside by Deed recorded January 7, 1987 as Instrument No. 2755, of Official Records of said Riverside County.

Also excepting therefrom all that portion thereof conveyed to the County of Riverside by Deed recorded January 7, 1987 as Instrument No. 2756, of Official Records of said Riverside County.

Also excepting therefrom the Westerly 30 feet of that portion of said land included within Lot 197 of the San Jacinto Land Association as described in Deed recorded June 18, 1913 in Book 377, Page 210 of Deeds, records of said Riverside County.

Assessor's Parcel Number: 433-110-004, Acres: 5.84
433-110-015, Acres: 4.81
433-110-021, Acres: 0.76
433-110-023, Acres: 0.02
433-110-025, Acres: 1.03
433-110-033, Acres: 2.86
433-110-034, Acres: 1.02
433-130-001, Acres: 1.41

Parcel 2:

Lot 197 of the Lands of the San Jacinto Lands Association as shown by map on file in Book 8, Page 357 of Maps, Records of San Diego County, California, in the City of San Jacinto, County of Riverside, State of California.

Excepting therefrom the Westerly 30 feet thereof as described in Deed recorded June 18, 1913 in Book 377, Page 210 of Deeds, Records of said Riverside County.

Also excepting therefrom all that portion thereof described in Deed recorded September 15, 1960 in Book 2766, Page 576 of Official Records of said Riverside County.

Also excepting therefrom all that portion thereof conveyed to the Riverside County Flood Control District by Deed recorded April 26, 1962 in Book 3126, Page 568 of Official Records of said Riverside County.

Also excepting therefrom any portion thereof located within the Ramona Expressway.

Assessor's Parcel Number: 433-130-020, Acres: 77.27

Parcel 3:

Lots 19, 11 and 12 of Jose Estudillo's Subdivision of Tract 7 of the Rancho San Jacinto Viejo, as shown by map on file in Book 6, Page 304 of Maps, Records of San Diego County California, in the City of San Jacinto, County of Riverside, State of California.

Excepting therefrom all that portion conveyed to Riverside County Flood Control and Water Conservation District by deed recorded April 26, 1962 in Book 3126, Page 568 of Official Records of said County.

Also excepting therefrom all that portion thereof conveyed to the County of Riverside by Deed recorded January 7, 1987 as Instrument No. 2755, of Official Records of said Riverside County.

Assessor's Parcel Number: 433-120-025, Acres: 13.67

433-120-026, Acres: 6.18

433-120-027, Acres: 0.33

Description of Wells:

State Well Number	**Popular Name or Reference Description**
04S01W25M001S	Agri Spice Ranch
04S01W25N002S	Agri Bath

DATED: Aug. 1, 2012

SAN JACINTO SPICE RANCH, INC.

By ______________________

~~Stephen~~ STEVEN Pastor, President

DATED: Aug 1, 2012

SAN JACINTO SPICE RANCH, INCORPORATED

By ______________________

~~Stephen~~ STEVEN Pastor, President

EXHIBIT "C"
TO
STIPULATION FOR ENTRY OF JUDGMENT

ASSIGNMENT OF BASE PRODUCTION RIGHTS
and
ELECTION

Defendants SAN JACINTO SPICE RANCH, INC., by Stephen Pastor, its President, and SAN JACINTO SPICE RANCH, INCORPORATED, by Stephen Pastor, its President, based on a collective assignment to said defendants of Base Production Rights under the proposed Stipulated Judgment in the amount of 265 acre feet per year collectively for all properties described on Exhibit "B," hereby elect to be classified collectively in these proceedings as

Class "A" Participants ____.
Class "B" Participants ✓.
(Select one)

DATED: AUG 1, 2012

SAN JACINTO SPICE RANCH, INC.

By [signature]
~~Stephen~~ STEVEN Pastor, President

DATED: AUG 1, 2012

SAN JACINTO SPICE RANCH, INCORPORATED

By [signature]
~~Stephen~~ STEVEN Pastor, President

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Attorneys for Plaintiff
EASTERN MUNICIPAL WATER DISTRICT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

EASTERN MUNICIPAL WATER DISTRICT, A California Municipal Water District, Plaintiff, vs. CITY OF HEMET; et al., Defendants.	CASE NO.: RIC 1207274 STIPULATION FOR ENTRY OF JUDGMENT

The parties hereto agree and stipulate as follows:

1. The following facts, considerations, and objectives, among others, provide the basis for this Stipulation for Entry of Judgment:

a. On May 16, 2012, the Eastern Municipal Water District commenced this action by filing a Complaint seeking the adjudication of an area within the San Jacinto Valley described in Exhibit "A" to the Complaint on file herein and known as the "Management Area." The Complaint alleges that the groundwater basins underlying the Management Area, to-wit, the Canyon, the San Jacinto Upper Pressure, and the Hemet North and Hemet South Basins are in a

state of overdraft and seeks correction of this condition by the Court through adjudication of certain rights to produce water therefrom.

b. Each of the parties executing this Stipulation has a direct interest in the quantity and quality of groundwater produced from within the Management Area.

c. The safe yield of the basins that comprise the Management Area is approximately 45,000 acre feet per year. For more than five years preceding the filing of the Complaint, the annual safe yield (as defined in Section 1.33 of the proposed Stipulated Judgment) of the groundwater under the Management Area has been exceeded by the total production therefrom, and a state of overdraft has existed continuously for at least five years. Groundwater production during this period has been open, notorious, continuous, adverse, hostile, and under a claim of right.

d. It is generally recognized and accepted that unmanaged downward decline in water levels has severe adverse impacts on the rights of groundwater producers and on water quality, will cause increased pumping lifts and may result in surface land subsidence.

e. It is apparent to the parties that protection of the rights of the parties and of the public interest in maximizing the beneficial use of a limited resource—groundwater supplies—within the Management Area requires the development, imposition and implementation of a physical solution.

2. The parties agree that the physical solution represented by the Water Management Plan set forth in the proposed Stipulated Judgment attached hereto as Exhibit "A," constitutes a fair and equitable basis for protection of the groundwater supply within the Management Area and for satisfaction of groundwater rights within said Management Area and is in furtherance of the mandate of the State Constitution establishing water policy within the State to maximize

beneficial use and avoid waste, and provides due consideration of the public interest and of the environment.

3. The parties agree that jurisdiction over each of the parties has been established by the allegations in the Complaint and that proper service of process of the Summons and Complaint upon each of the defendants has occurred.

4. The parties agree that the proper venue for this matter is the California Superior Court for the County of Riverside. The parties further agree that the Answers on behalf of all defendants appearing in this action have been filed, generally denying all allegations in the Complaint except those expressly admitted.

5. The parties agree that a Judgment in the form attached hereto as Exhibit "A" may be made and entered by the Court binding these stipulating parties in this action. Each Private Pumper defendant signing this Stipulation shall attach to this Stipulation as Exhibit "B," a signed description of said defendant's property within the Management Area, including the acreage thereof; and, as Exhibit "C," the signed form indicating said defendant's election to be classified as a Class "A" or Class "B" Participant.

6. Accordingly, the parties request that the Court hold a hearing to determine whether there is any objection to said proposed Judgment.

7. The parties agree that in the event that the Court is unwilling to enter a final judgment identical to the Judgment attached hereto as Exhibit "A," this Stipulation will have no binding effect upon any of the parties to this Stipulation, and shall be considered null and void. The parties further agree that in the event this Stipulation becomes null and void under this provision, all defendants will have thirty (30) days to file and serve amended responsive pleadings.

8. The parties agree that this Stipulation may be executed in counterparts, each of which will be filed with the Court.

PLAINTIFF:

DATED: ___________, 2012 EASTERN MUNICIPAL WATER DISTRICT

By_______________________________

DEFENDANT:

DATED: ___________, 2012 LAKE HEMET MUNICIPAL WATER DISTRICT

By_______________________________

DEFENDANT:

DATED: ___________, 2012 CITY OF HEMET

By_______________________________

DEFENDANT:

DATED: ___________, 2012 CITY OF SAN JACINTO

By_______________________________

DEFENDANTS/PUMPERS:

DATED: 9/20, 2012

SCOTT A.G. PROPERTIES, L.P.,
a California Limited Partnership

By Stan A Scott

Its Partner
(Office or Position)

DATED: 9/20, 2012

SCOTT AG PROPERTY, L.P.,
a California Limited Partnership

By Stan A Scott

Its Partner
(Office or Position)

EXHIBIT "B"

TO

STIPULATION FOR ENTRY OF JUDGMENT

<u>Description of Defendant's Property and Wells Within the Management Area</u>

Defendants, SCOTT A.G. PROPERTIES, L.P., a California Limited Partnership, by Stan W Deatts its Partner; and SCOTT AG PROPERTY, L.P., a California Limited Partnership, by Stan Deatts its Partner, certify that the following is a description of the property and wells owned by said defendants within the Management Area:

<u>Description & Acreage of each Parcel:</u>

All that certain real property situated in the County of Riverside, State of California, described as follows:

Parcel 1:

That portion of Lots 2 and 3 lying within the projected lines of Sections 5 and 6, Township 4 South, Range 1 West, and Section 1, Township 4 South and Range 2 West of the partition of the Rancho San Jacinto Nuevo, in the County of Riverside, (formerly San Diego County), State of California, as set apart to Mrs. Helena Pedrorena De Wolfskill, J.W. Nance and Charles E. McGarry in decree of partition dated May 22, 1891 in the Superior Court of the State of California, in and for the County of San Diego, a certified copy of which was recorded in Book 178, Page 381, of Deeds, San Diego County Records, described as follows:

Commencing at a point in the Northerly line of Section 6, Township 4 South, Range 1 West, San Bernardino Base and Meridian, said point being South 89°35'26" East 1,192.64 feet measured along said Northerly line from a found 3-inch iron pipe with brass cap marked "U.S. Forest Boundary Post No. 1, Range 1 West, Township 3 South, Section 31", set at the intersection of said Northerly line with the Easterly boundary of the Rancho San Jacinto Nuevo, said point also being North 89°35'26" West 637.94 feet, more or less, measured along said Northerly line from a found 3-1/2 inch iron pipe with brass cap marked U.S. Forest Boundary No. 2, Sections 31, 32

6 and 5, Township 3 South, Township 4 South, Range 1 West, 1904", set at the Northeast corner of said Section 6; thence South 46°02'28" West to a point of intersection with the Southwest line of Gilman Springs Road as conveyed to the State of California by deed recorded November 14, 1962 as Instrument No. 104821, said point being the true point of beginning; Thence continuing South 46°02'28' West to the Northeast line of Block 11 of Consolidated Reservoir and Power Company's Subdivision of San Jacinto Lake Tract, as per map recorded in Book 6, Page 83 of Maps, in the Office of the County Recorder of Riverside County; Thence South 46°01' East, along said Northeast line of Block 11, 400.00 feet, more or less to the Northwest corner of Block 17 of said Consolidated Reservoir and Power Company's Subdivision; Thence North 89°51' East, along the North line of said Block 17, 1,320 feet; Thence South 132.00 feet; Thence North 89°53' East along the Northerly line of Block 17, 3,960.80 feet to the Northeasterly corner of said Block 17, said Northeast corner being also Corner No. 11 of Lot 2 of said Rancho San Jacinto Nuevo; Thence South 0°03' East along the Easterly line of Block 17, 498.00 feet to an angle point in the Northerly line of said Block, said point being also Corner No. 12 of Lot 2 of said Rancho San Jacinto Nuevo; Thence North 89°57' East, to the West line of Sanderson Avenue conveyed to the County of Riverside by deed recorded March 3, 1967 as Instrument No. 17943; Thence North 0°00'47" East, 616.50 feet to the beginning of a tangent curve having a radius of 1,100 feet and being concave Westerly; Thence Northerly along the arc of said curve through a central angle of 13°42'04", 263.04 feet; Thence North 45°20'28" West, 64.53 feet; Thence North 75°59' West, 179.42 feet to the beginning of a tangent curve having a radius of 424.24 feet and being concave Northeasterly; Thence Northwesterly along the arc of said last described curve, through an angle of 37°15'55" 275.93 feet; Thence North 38°43'05" West, 300.14 feet to the point of beginning of a nontangent curve having a radius of 470.00 feet and being concave Southwesterly, also from which point of beginning a radial line thereof bears South 48°02'06" West; Thence, Northwesterly along the arc of said last described curve, through an angle of 27°08'24", 222.63 feet to a point on the Southerly line of the right of way of State Highway Route 177, last said point also being on a curve having a radius of 2,270.35 feet and being concave Southerly, also from which point a radial line of said last described curve bears South 13°24'45" West; Thence Northwesterly along the Southwesterly line of Gilman Springs Road as conveyed to the State of California by deed recorded November 14, 1962 as Instrument No. 104821 to the point of beginning.

Except the Northwest 330.00 feet thereof as conveyed to the Southern California Edison Company as Strip 4 in the deed recorded November 18, 1970 as Instrument No. 115918 of Official Records.

Also except that portion described as follows:

Beginning at a point in the West line of Sanderson Avenue as conveyed to the County of Riverside, by deed recorded March 3, 1967 as Instrument No. 17943, of Official Records said point being the Southerly terminus of that certain curve in said West line as described as being concave Westerly and having a radius of 1,100.00 feet; Thence along said West line South 0°00'47" West 152.41 feet to the Southerly line of Section 5, Township 4 South, Range 1 West, San Bernardino Base and Meridian; Thence along said Southerly line North 89°40'17" West, 2,268.00 feet; Thence at right angles North 0°19'43" East 1,144.56 feet to the Southerly line of

Gilman Springs Road as conveyed to the State of California by deed recorded November 14, 1962 as Instrument No. 104821; Thence Easterly along the Southerly line of Gilman Springs Road as conveyed to the State of California by deed recorded November 14, 1962 as Instrument No. 104821 and Easterly along the Southerly line of Gilman Springs Road and Southerly along the West line of Sanderson Avenue as conveyed to the County of Riverside by deed recorded March 3, 1967 as Instrument No. 17943, of Official Records, to the point of beginning.

Also except that portion as conveyed to the County of Riverside by deed recorded October 13, 1993 as Instrument No. 401588 of Official Records.

Also except that portion conveyed to the Riverside County Transportation Commission, recorded December 11, 1996 as Instrument No. 467882 of Official Records.

Also except that portion conveyed to Stanley A. Scott and Linda F. Scott, husband and wife as joint tenants, by document recorded December 11, 1996 as Instrument No. 467883 of Official Records.

Excepting therefrom all that portion thereof conveyed to the County of Riverside by deed recorded May 13, 2004 as Instrument No. 2004-0357577 of Official Records of said Riverside County.

Assessor's Parcel Number:	430-050-017; 1.69 Acres
	430-050-018; 7.23 Acres
	430-050-030; 69.01 Acres
	430-050-031; 308.23 Acres
	430-060-023; 12.84 Acres
	430-060-024; 0.68 Acres
	430-060-025; 20.61 Acres
	425-080-012; 0.52 Acres

Parcel 2:

All that portion of a strip of land, 330.00 feet wide, described and designated as Strip 4 in that certain Grant Deed from Mono Power Company, a Corporation, to Southern California Edison Company, a Corporation, recorded November 18, 1970 as Instrument No. 115918, of Official Records, in the Office of the County Recorder of said County, lying Easterly of the Easterly projected line of Section 1, Township 4 South, Range 2 West, of the partition of The Rancho San Jacinto Nuevo, Riverside County, (formerly San Diego County), State of California, as set apart to Mrs. Pedrorena De Wolkskill, J.W. Nance and Charles E. McGarry to Decree of Partition dated May 22, 1891, in the Superior Court of the State of California, in and for the County of San Diego, a certified copy of which was recorded in Book 178, Page 381 of Deeds, San Diego County Records.

Excepting therefrom all that portion thereof conveyed to the County of Riverside by deed recorded May 13, 2004 as Instrument No. 2004-0357577 of Official Records of said Riverside County.

Assessor's Parcel Number: 430-050-014; 43.25 Acres

Parcel 3:

All those portions of Blocks 13, 14 and 17 of Consolidated Reservoir and Power Company's Subdivision of the San Jacinto Lake Tract, as shown by map on file in Book 6, Page 83 of Maps, Riverside County Records, which lies Northerly of the center line of that certain 500 foot easement for river channel and bank protection works, as granted to the County of Riverside, by deed recorded January 17, 1939 in Book 403, Page 373 of Official Records, the center line of said 500 foot strip being described as follows:

Beginning at a point on the Southerly boundary of said Block 13, from which point the Southeast corner of said Block bears North 89°48' East, 14.33 feet; thence from said point of beginning North 59°47'30" West, 83.0 feet; thence curving to the left on the arc of an 8000 foot radius curve through an angle of 20°02'30" for an arc distance of 2798.34 feet; thence North 79°50' West, 907.86 feet; thence curving to the right on the arc of a 7000 foot radius curve through an angle of 24°10' for an arc distance of 2952.52 feet; thence North 55°40' West, 1097.44 feet; thence curving to the left on the arc of a 3000 foot radius curve through an angle of 52°20' for an arc distance of 2740.17 feet; thence South 72°00' West 158.51 feet to a point on the Southerly prolongation of the Easterly boundary of Block 19, as shown on said map, from which point the Northeast corner of said Block 19 bears North 1715.27 feet.

The side lines of said 500 foot strip of land are to be prolonged or shortened so as to terminate on the Southerly and Easterly boundaries of said Block 13 and on the Easterly boundaries of Blocks 12 and 19.

Excepting from Blocks 13 and 14 that portion lying West of the Westerly line of Section 7, Township 4 South, Range 1 West, San Bernardino Base and Meridian.

Assessor's Parcel Number: 430-060-019; 213.77 Acres

Parcel 4:

That portion of Lot 1 of the Partition of the Rancho San Jacinto Nuevo and more particularly shown on the Partition Map accompanying Partition Decree had in the Superior Court of the State of California, in and for the County of San Diego and referred to in book 178, Page 381 of Deeds, San Diego County Records and that portion of Tract 2 of the Partition of the Rancho San Jacinto Viejo, more particularly described in the Partition Decree had in the Superior Court of the State of California, in and for the County of San Diego, recorded in Book 43, Page 161 of Deeds, San Diego County Records and that portion of Lot C of the map showing the Subdivision of Lot 4, San Jacinto Nuevo and Lot 3, San Jacinto Viejo, on file in Book 1, Pages 10 and 11 of Maps, Riverside County Records, described as follows:

Beginning at the Northwest corner of said Lot 1 (being Lot Corner 3 of said Lot 1); thence North 89°56'50" East on the Northerly line of said Lot 1, a distance of 3112.49 feet to the West line of

Sanderson Avenue as conveyed to the County of Riverside by deed recorded December 14, 1966 as Instrument No. 119265, said point being the Northwest corner of the parcel of land described in said deed; thence South 0°00'47" West, 3083.85 feet; thence South 08°32'38" West, 101.12 feet; thence South 0°00'47" West, 690.81 feet to a point on the center line of that certain 400 foot easement for river channel and bank protection works, as granted to the County of Riverside by deed recorded August 10, 1946 in Book 764, Page 469 of Official Records and as shown on that Record of Survey on file in Book 46, Page 99 of Records of Survey; thence Northwest along said center line to a point which bears South 89°49' West, 14.33 feet from the Southeast corner of Block 13 as shown on the map of Consolidated Reservoir and Power Company's Subdivision of San Jacinto Lake Tract on file in Book 6, Page 83 of Maps, Riverside County Records; thence North 89°49' East, 14.33 feet to said Southeast corner of Block 13; thence North 00°11'00" East on the East line of Blocks 13, 14 and 17 as shown on the map recorded in Book 6, Page 83 of Maps, Riverside County Records, 2141.50 feet to the point of beginning.

Excepting therefrom, all that portion thereof conveyed to the County of Riverside by deed recorded October 13, 1993 as Instrument No. 401590 and all that portion thereof conveyed to the Riverside County Transportation Commission by deed recorded December 12, 1996 as Instrument No. 469354 both of Official Records of said Riverside County.

Assessor's Parcel Number: 430-070-011; 140.69 Acres
436-110-014; 58.18 Acres
430-140-007; 3.46 Acres

Description of Wells:

State Well Number	**Popular Name or Reference Description**
04S01W06Q002S	Scott Dairy Domestic
04S01W08E001S	Scott Dairy River
04S01W08E002S	Scott Dairy River OC
04S01W08G001S	Scott Dairy Sanderson
04S01W08C001S	Scott Dairy Wolfskill
04S01W07A001S	Scott Dairy Yard

DATED: 9/20, 2012

SCOTT A.G. PROPERTIES, L.P.,
a California Limited Partnership

By [signature]

Its Partner
(Office or Position)

DATED: 9/20, 2012

SCOTT AG PROPERTY, L.P.,
a California Limited Partnership

By [signature]

Its Partner
(Office or Position)

EXHIBIT "C"
TO
STIPULATION FOR ENTRY OF JUDGMENT

ASSIGNMENT OF BASE PRODUCTION RIGHTS
and
ELECTION

Defendants SCOTT A.G. PROPERTIES, L.P., a California Limited Partnership, by Stan A Scott its Partner; and SCOTT AG PROPERTY, L.P., a California Limited Partnership, by Stan A Scott its Partner, based on a collective assignment to said defendants of Base Production Rights under the proposed Stipulated Judgment in the amount of 1,755 acre feet per year collectively for all properties described on Exhibit "B," hereby elect to be classified collectively in these proceedings as

Class "A" Participants ____
Class "B" Participants ✓.
(Select one)

DATED: 9/20, 2012

SCOTT A.G. PROPERTIES, L.P.,
a California Limited Partnership

By Stan A Scott

Its Partner
(Office or Position)

DATED: 9/20, 2012

SCOTT AG PROPERTY, L.P.,
a California Limited Partnership

By Stan A Scott

Its Partner
(Office or Position)

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GERALD D. SHOAF, SBN 41084
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Attorneys for Plaintiff
EASTERN MUNICIPAL WATER DISTRICT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

EASTERN MUNICIPAL WATER DISTRICT, A California Municipal Water District, Plaintiff, vs. CITY OF HEMET; et al., Defendants.	CASE NO.: RIC 1207274 STIPULATION FOR ENTRY OF JUDGMENT

The parties hereto agree and stipulate as follows:

1. The following facts, considerations, and objectives, among others, provide the basis for this Stipulation for Entry of Judgment:

a. On May 16, 2012, the Eastern Municipal Water District commenced this action by filing a Complaint seeking the adjudication of an area within the San Jacinto Valley described in Exhibit "A" to the Complaint on file herein and known as the "Management Area." The Complaint alleges that the groundwater basins underlying the Management Area, to-wit, the Canyon, the San Jacinto Upper Pressure, and the Hemet North and Hemet South Basins are in a

state of overdraft and seeks correction of this condition by the Court through adjudication of certain rights to produce water therefrom.

b. Each of the parties executing this Stipulation has a direct interest in the quantity and quality of groundwater produced from within the Management Area.

c. The safe yield of the basins that comprise the Management Area is approximately 45,000 acre feet per year. For more than five years preceding the filing of the Complaint, the annual safe yield (as defined in Section 1.33 of the proposed Stipulated Judgment) of the groundwater under the Management Area has been exceeded by the total production therefrom, and a state of overdraft has existed continuously for at least five years. Groundwater production during this period has been open, notorious, continuous, adverse, hostile, and under a claim of right.

d. It is generally recognized and accepted that unmanaged downward decline in water levels has severe adverse impacts on the rights of groundwater producers and on water quality, will cause increased pumping lifts and may result in surface land subsidence.

e. It is apparent to the parties that protection of the rights of the parties and of the public interest in maximizing the beneficial use of a limited resource—groundwater supplies—within the Management Area requires the development, imposition and implementation of a physical solution.

2. The parties agree that the physical solution represented by the Water Management Plan set forth in the proposed Stipulated Judgment attached hereto as Exhibit "A," constitutes a fair and equitable basis for protection of the groundwater supply within the Management Area and for satisfaction of groundwater rights within said Management Area and is in furtherance of the mandate of the State Constitution establishing water policy within the State to maximize

beneficial use and avoid waste, and provides due consideration of the public interest and of the environment.

3. The parties agree that jurisdiction over each of the parties has been established by the allegations in the Complaint and that proper service of process of the Summons and Complaint upon each of the defendants has occurred.

4. The parties agree that the proper venue for this matter is the California Superior Court for the County of Riverside. The parties further agree that the Answers on behalf of all defendants appearing in this action have been filed, generally denying all allegations in the Complaint except those expressly admitted.

5. The parties agree that a Judgment in the form attached hereto as Exhibit "A" may be made and entered by the Court binding these stipulating parties in this action. Each Private Pumper defendant signing this Stipulation shall attach to this Stipulation as Exhibit "B," a signed description of said defendant's property within the Management Area, including the acreage thereof; and, as Exhibit "C," the signed form indicating said defendant's election to be classified as a Class "A" or Class "B" Participant.

6. Accordingly, the parties request that the Court hold a hearing to determine whether there is any objection to said proposed Judgment.

7. The parties agree that in the event that the Court is unwilling to enter a final judgment identical to the Judgment attached hereto as Exhibit "A," this Stipulation will have no binding effect upon any of the parties to this Stipulation, and shall be considered null and void. The parties further agree that in the event this Stipulation becomes null and void under this provision, all defendants will have thirty (30) days to file and serve amended responsive pleadings.

8. The parties agree that this Stipulation may be executed in counterparts, each of which will be filed with the Court.

PLAINTIFF:

DATED: ____________, 2012 EASTERN MUNICIPAL WATER DISTRICT

By________________________________

DEFENDANT:

DATED: ____________, 2012 LAKE HEMET MUNICIPAL WATER DISTRICT

By________________________________

DEFENDANT:

DATED: ____________, 2012 CITY OF HEMET

By________________________________

DEFENDANT:

DATED: ____________, 2012 CITY OF SAN JACINTO

By________________________________

DEFENDANTS/PUMPERS:

DATED: August 29, 2012

GEORGE R. PHILLIPS, Trustee of the John & Sheryll Te Velde Children's Irrevocable Trust

DATED: August 23, 2012

SIDNEY SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust

DATED: August 23, 2012

ANNE SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust

EXHIBIT "B"

TO

STIPULATION FOR ENTRY OF JUDGMENT

<u>Description of Defendant's Property and Wells Within the Management Area</u>

Defendants, GEORGE R. PHILLIPS, Trustee of the John & Sheryll Te Velde Children's Irrevocable Trust; SIDNEY SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust; and ANNE SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust, certify that the following is a description of the property and wells owned by said defendants within the Management Area:

<u>Description & Acreage of each Parcel</u>:

All that certain real property situated in the County of Riverside, State of California, described as follows:

Parcel 1: (Assessor's Parcel Number: 425-070-004; 425-070-005)

That portion of Block 12, 14 and 19 of Consolidated Reservoir and Power Company's Subdivision of San Jacinto Lake Tract as shown by map on file in Book 6, Page 83 of Maps, Records of Riverside County, California, described as follows:

Beginning at a point in the West line of said Block 12 at the Southeast corner of Block "B" as shown on said map, said point also being Corner No. 22 of Lot 3 of the Partition of Rancho San Jacinto Nuevo; thence North 0°23'25" West, 1425.80 feet to the most Northerly corner of that certain strip of land 500 feet in width described in easement to the Riverside County Flood Control and Water Conservation District recorded September 13, 1947 in Book 861, Page 351 of Official Records of Riverside County, California; thence South 60°08'17" East on the Northerly line of said 500 foot strip of land, 1314.91 feet to the beginning of a tangent curve therein; thence Easterly on a curve concave to the Northeast having a radius of 2250 feet through a central angle of 11°10'23" an arc length of 438.75 feet; thence South 0°23'25" East, 523.29 feet to the Southerly line of said 500 foot easement; thence Northwesterly on a curve concave to the Northeast, having a radius of 2750 feet through a central angle of 14°44'23" an arc distance of

707.46 feet (the initial radius line bears South 15°07'20" West); thence North 60°08'17" West, 177.79 feet; thence South 0°12'51" East, 1141.75 feet; thence North 66°36'54" West, 795.60 feet to the West line of said Block 12; thence North 0°12'51" West on said West line of Block 12, 400 feet to the point of beginning;

Excepting therefrom that portion which lies Westerly of a line which is described as follows:

Beginning at the most Westerly corner of Block 19; thence South 17°10' West , 122.8 feet to the North corner of Block 12.

Parcel 2: (Assessor's Parcel Number: 425-070-024, 025, 026, 015, 017; 425-090-007, 009, 025)

That portion of Blocks 12, 14 and 19 of Consolidated Reservoir and Power Company's Subdivision of San Jacinto Lake Tract, as shown by a map on file in Book 6, Page 83 of maps, Riverside County Records; and that portion of Lots A, C and D of the subdivision of Lot 4 of San Jacinto Nuevo and Lot 3 of San Jacinto Viejo, as shown by map on file in Book 1, Pages 10 and 11 of Maps, Riverside County Records, described as follows:

Beginning at the Southeast corner of Block 12 of said Consolidated Reservoir and Power Company's Subdivision;

Thence South 26°35'22" West, 675.53 feet;
Thence South 2,003.97 feet to the Northerly line of Pico Road as conveyed to the County of Riverside by deed recorded July 10, 1930 in Book 869, Page 100 of Deeds, Riverside County Records;
Thence North 52°58'00" West, along said Northerly line of Pico Road, 3,722.48 feet (recorded 3745.11 feet);
Thence North 37°02'00" East, (recorded North 37°01'34" East) 10.00 feet, to the beginning of a tangent curve concave to the Southwest having a radius of 5,040.00 feet, a radial line to the beginning of said curve bears North 37°02'00" East;
Thence Northeasterly along the arc of said curve, through a central angle of 9°18'37" 818.98 feet (recorded 819.10 feet) to a point on the West line of said Block 12; a radial line through said point bears North 27°43'23" East (recorded North 27°42'52" East);
Thence North 00°12'40" West along said West line of said Block 12, 2,134.49 feet, more or less, to the Southwesterly corner of that certain parcel conveyed to Frank Motte and Elizabeth Motte, husband and wife by deed recorded March 13, 1963 as Instrument No. 24943;
Thence South 66°36'43" East along the Southerly line of said Motte Parcel 795.60 feet to the most
Southerly corner of said Motte Parcel;
Thence North 00°12'40" West along the East line of said Motte Parcel, 1,141.43 feet to the Southerly line of that certain strip of land, 500 feet in width, described in easement to the Riverside County Flood Control and Water Conservation District, recorded September 13, 1947 in Book 861, Page 351, of Official Records Riverside County Records;
Thence South 60°08'08" East along the Southerly line of said strip of land 177.46 feet to the beginning of a tangent curve concave to the North having a radius of 2750.00 feet; a radial line to the beginning of said curve bears South 29°51'52" West;

Thence Easterly along the arc of said curve through a central angle of 14°44'23" 707.46 feet to a point on said curve, a radial line through said point bears South 15°07'29' West;
Thence North 00°23'09" West 523.42 feet to a point on the Northerly line of said 500 foot wide easement, said point also being on the arc of a curve concave to the North, having a radius of 2250.00 feet, a radial line through said point bears South 18°41'29" West;
Thence Easterly along the arc of said curve through a central angle of 36°39'47", 745.49 feet to the end of said curve, a radial line through said end bears South 17°58'18" East;
Thence North 72°01'42" East, 1,075.66 feet to the East line of said Block 12;
Thence South along the East line of said Block 12, 3,528.18 feet to the point of beginning;

Excepting therefrom that portion lying within Old Pico Road, 20 feet in width, as same is shown on said map on file in Book 6, Page 83 of Maps, Riverside County Records.

Also excepting therefrom that potion conveyed to the County of Riverside by deed recorded January 27, 1970 as Instrument No. 7981;

Also excepting therefrom that portion conveyed to Mono Power Company by deed recorded October 31, 1972 as Instrument No. 145165.

Parcel 3: (Assessor's Parcel Number: 425-070-014)

That portion of Lots "A", "C" and "D" of the subdivision of Lot 4 of San Jacinto Nuevo, as shown by map on file in Book 1, Pages 10 and 11 of Maps, in the Office of the County Recorder of said County, lying within a strip of land, three hundred thirty (330) feet wide, said strip of land being described and designated as Strip 2 in that certain Grant Deed from Mono Power to Southern California Edison Company, recorded October 31, 1972 as Instrument No. 145166 of Official Records in the Office of the County Recorder of said County.

Parcel 4: (Assessor's Parcel Number: 425-070-021, 027, 028, 029)

That portion of Blocks 12, 14 and 19 of Consolidated Reservoir and Power Company's Subdivision of the San Jacinto Lake Tract as shown by map on file in Book 6, Page 83 of map, in the Office of the County Recorder of said County and that portion of Lots "A" and "D" of the subdivision of Lot 4 of San Jacinto Nuevo, as shown by map on file in Book 1, Pages 10 and 11 of Maps, in the Office of the County Recorder of said County, lying within a strip of land of varying width, the surveyed reference line of which is described as follows:

Beginning at a point in the boundary line of the Rancho San Jacinto Nuevo, said point being North 50°24'19" West, 2861.30 feet, measured along said boundary line from a found 3 inch iron pipe with brass cap marked "U.S. Forest Boundary Post No. 1-R, 1 W., T. 3 S. Sec. 31" said point also being South 50°24'19" East, 1571.89 feet, more or less, measured along said boundary line from a found 1 inch iron pipe set at Corner No. 3, in the boundary line of said Rancho San Jacinto Nuevo; thence South 42°11'16" West, 13.734.77 feet more or less, to a point in the North-South center line of Section 11, Township 4 South, Range 2 West, of said Rancho San Jacinto Nuevo, last mentioned point being North 00°12'53" East, 2225.09 feet, measured along said center line from a found ¾ inch iron pipe and metal tag stamped "R.C.E. 9876" set at the South one-quarter corner of said Section 11, said last mentioned point also being South

00°12'53" West, 3081.69 feet more or less, measured along said center line from a found 2 inch iron pipe and metal tag stamped "L.S. 3035" set at the North onequarter corner of said Section 11.

That portion of said strip of land of varying width, which extends from that certain course described as having a bearing of North 72°01'42" East and a length of 1075.66 feet in that certain deed to John B. Mainvil, recorded on May 20, 1965 as Instrument No. 58323 of Official Records, in the Office of the County Recorder of said County, to the Westerly line of Section 12, Township 4 South, Range 2 West, of said Rancho San Jacinto Nuevo, shall be three hundred sixth (360) feet wide, the side lines thereof being one hundred thirty (130) feet right and two hundred thirty (230) feet left, measured at right angles, respectively, from said surveyed reference line.

The remainder of said strip of land of varying width shall be three hundred twenty (320) feet wide, the side lines thereof being one hundred ten (110) feet right and two hundred ten (210) feet left, measured at right angles, respectively, from said surveyed reference line.

Excepting therefrom that portion thereof lying Northerly of that certain course described as having a bearing of North 72°01'42" East and a length of 1075.66 feet, in the certain deed to John B. Mainvil, recorded on May 20, 1965 as Instrument No. 58323 of said Official Records.

Also excepting therefrom that portion thereof lying Southwesterly of the Northeasterly line of Parcel 1 described in the deed to the County of Riverside recorded on January 27, 1970 as Instrument No. 7981 of Official Records.

Also excepting therefrom that portion thereof lying within Old Pico Road 20 feet in width as same is shown on said map on file in Book 6, Page 83 of Maps in the Office of the County Recorder of said County.

Also excepting all uranium, thorium, and other fissionable materials, all oil, gas petroleum, asphaltum and other hydrocarbon substances and other minerals and mineral ores of every kind and character, whether similar to these herein specified or not, within or underlying, or which may be produced from the hereinbefore described land, together with the right to use that portion only of said land which underlies a plane parallel to and five hundred (500) feet below the present surface of said land, for the purpose of prospecting for, developing and/or extracting said uranium, thorium, and other fissionable materials, oil, gas, petroleum, asphaltum, and other mineral or hydrocarbon substances from said land, it being expressly understood and agreed that said grantor, its successors and assigns, shall have no right to enter upon the surface of said land, or to use said land or any portion thereof to said depth of five hundred (500) feet, fore any purpose whatsoever.

Description of Wells:

State Well Number	**Popular Name or Reference Description**
04S02W11J002S	Sybrandy Dairy
04S02W11J001S	Sybrandy Dairy Ag
04S02W12N002S	Sybrandy Dairy Southeast
04S02W11B002S	Quail Ranch Golf East
04S02W11B001S	Quail Ranch Golf West

DATED: August 27, 2012

GEORGE R. PHILLIPS, Trustee of the
John & Sheryll Te Velde Children's
Irrevocable Trust

DATED: August 23, 2012

SIDNEY SYBRANDY, Trustee of the
Sid & Anne Sybrandy 2002 Trust

DATED: August 23, 2012

ANNE SYBRANDY, Trustee of the
Sid & Anne Sybrandy 2002 Trust

EXHIBIT "C"

TO
STIPULATION FOR ENTRY OF JUDGMENT

ASSIGNMENT OF BASE PRODUCTION RIGHTS
and
ELECTION

Defendants GEORGE R. PHILLIPS, Trustee of the John & Sheryll Te Velde Children's Irrevocable Trust; SIDNEY SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust; and ANNE SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust, based on a collective assignment to said defendants of Base Production Rights under the proposed Stipulated Judgment in the amount of 1,454 acre feet per year collectively for all properties described on Exhibit "B," hereby elect to be classified collectively in these proceedings as

Class "A" Participants X.

Class "B" Participants ____.

(Select one)

DATED: August 29, 2012

[signature]
GEORGE R. PHILLIPS, Trustee of the John & Sheryll Te Velde Children's Irrevocable Trust

DATED: August 23, 2012

[signature]
SIDNEY SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust

DATED: August 23, 2012

[signature]
ANNE SYBRANDY, Trustee of the Sid & Anne Sybrandy 2002 Trust

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Attorneys for Plaintiff
EASTERN MUNICIPAL WATER DISTRICT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

EASTERN MUNICIPAL WATER DISTRICT, A California Municipal Water District, Plaintiff, vs. CITY OF HEMET; et al., Defendants.	CASE NO.: RIC 1207274 STIPULATION FOR ENTRY OF JUDGMENT

The parties hereto agree and stipulate as follows:

1. The following facts, considerations, and objectives, among others, provide the basis for this Stipulation for Entry of Judgment:

a. On May 16, 2012, the Eastern Municipal Water District commenced this action by filing a Complaint seeking the adjudication of an area within the San Jacinto Valley described in Exhibit "A" to the Complaint on file herein and known as the "Management Area." The Complaint alleges that the groundwater basins underlying the Management Area, to-wit, the Canyon, the San Jacinto Upper Pressure, and the Hemet North and Hemet South Basins are in a

state of overdraft and seeks correction of this condition by the Court through adjudication of certain rights to produce water therefrom.

b. Each of the parties executing this Stipulation has a direct interest in the quantity and quality of groundwater produced from within the Management Area.

c. The safe yield of the basins that comprise the Management Area is approximately 45,000 acre feet per year. For more than five years preceding the filing of the Complaint, the annual safe yield (as defined in Section 1.33 of the proposed Stipulated Judgment) of the groundwater under the Management Area has been exceeded by the total production therefrom, and a state of overdraft has existed continuously for at least five years. Groundwater production during this period has been open, notorious, continuous, adverse, hostile, and under a claim of right.

d. It is generally recognized and accepted that unmanaged downward decline in water levels has severe adverse impacts on the rights of groundwater producers and on water quality, will cause increased pumping lifts and may result in surface land subsidence.

e. It is apparent to the parties that protection of the rights of the parties and of the public interest in maximizing the beneficial use of a limited resource—groundwater supplies—within the Management Area requires the development, imposition and implementation of a physical solution.

2. The parties agree that the physical solution represented by the Water Management Plan set forth in the proposed Stipulated Judgment attached hereto as Exhibit "A," constitutes a fair and equitable basis for protection of the groundwater supply within the Management Area and for satisfaction of groundwater rights within said Management Area and is in furtherance of

the mandate of the State Constitution establishing water policy within the State to maximize beneficial use and avoid waste, and provides due consideration of the public interest and of the environment.

3. The parties agree that jurisdiction over each of the parties has been established by the allegations in the Complaint and that proper service of process of the Summons and Complaint upon each of the defendants has occurred.

4. The parties agree that the proper venue for this matter is the California Superior Court for the County of Riverside. The parties further agree that the Answers on behalf of all defendants appearing in this action have been filed, generally denying all allegations in the Complaint except those expressly admitted.

5. The parties agree that a Judgment in the form attached hereto as Exhibit "A" may be made and entered by the Court binding these stipulating parties in this action. Each Private Pumper defendant signing this Stipulation shall attach to this Stipulation as Exhibit "B," a signed description of said defendant's property within the Management Area, including the acreage thereof; and, as Exhibit "C," the signed form indicating said defendant's election to be classified as a Class "A" or Class "B" Participant.

6. Accordingly, the parties request that the Court hold a hearing to determine whether there is any objection to said proposed Judgment.

7. The parties agree that in the event that the Court is unwilling to enter a final judgment identical to the Judgment attached hereto as Exhibit "A," this Stipulation will have no binding effect upon any of the parties to this Stipulation, and shall be considered null and void.

The parties further agree that in the event this Stipulation becomes null and void under this provision, all defendants will have thirty (30) days to file and serve amended responsive pleadings.

8. The parties agree that this Stipulation may be executed in counterparts, each of which will be filed with the Court.

PLAINTIFF:

DATED: ___________, 2012 EASTERN MUNICIPAL WATER DISTRICT

By______________________________

DEFENDANT:

DATED: ___________, 2012 LAKE HEMET MUNICIPAL WATER DISTRICT

By______________________________

DEFENDANT:

DATED: ___________, 2012 CITY OF HEMET

By______________________________

DEFENDANT:

DATED: ___________, 2012 CITY OF SAN JACINTO

By______________________________

DEFENDANTS/PUMPERS:

DATED: December 12, 2012

Donald Dick Van Dam

DONALD DICK VAN DAM, Trustee of the Donald Dick and Frances L. Van Dam Revocable Trust

DATED: December 12, 2012

Frances L. Van Dam

FRANCES L. VAN DAM, Trustee of the Donald Dick and Frances L. Van Dam Revocable Trust

EXHIBIT "B"

TO

STIPULATION FOR ENTRY OF JUDGMENT

Description of Defendant's Property and Wells Within the Management Area

Defendants, DONALD DICK VAN DAM & FRANCES L. VAN DAM, Trustees of The Donald Dick & Frances L. Van Dam Revocable Family Trust, certify that the following is a description of the property and wells owned by said defendants within the Management Area:

Description & Acreage of each Parcel:

All that certain real property situated in the County of Riverside, State of California, described as follows:

Parcel A:

Parcel 2 of Parcel Map No. 18393, in the City of San Jacinto, County of Riverside, State of California, as per plat recorded in Book 106 of Parcel Maps, Pages 62, 63 and 64, in the Office of the County Recorder of said County.

Assessor's Parcel Number: 432-180-004, Acres: 77.00

Parcel B:
That portion of Parcel 3 of Parcel Map 18393, in the city of San Jacinto, County of Riverside, State of California, as shown by map recorded in Book 106, Pages 62, 63 and 64, of Parcel Maps, in the Office of the County Recorder of said County, California, described as follows:

Beginning at the Northwest corner of said Parcel 3;
Thence South 00°25'29" East 149.20 feet; thence South 89°34'31" East, 55.45 feet to the true point of beginning; thence South 89°34'31" East 30.00 feet; Thence South 00°25'29" East 30.00 feet; thence North 89°34'31" West 30.00 feet; thence North 00°25'29" West 30.00 feet to the true point of beginning.

Said property is shown as "well lot" on said Parcel Map 18393.
Assessor's Parcel Number: 432-190-015, Acres: 0.02

Parcel C:

A non-exclusive easement for ingress and egress and a right of way for the purpose of operating, using, maintaining, repairing, renewing, improving, enlarging, or re-drilling the water well located on the above described "well lot", and for the use, operation, maintenance, repair, improvement, reconstruction, replacement and renewal of the concrete water pipeline and water pipeline system presently running from and across said land, together with the right to install and/or replace said pipeline and other items necessary or convenient for the transportation and conveyance of water under across and through said land, together with the right to make any and all excavations reasonably necessary and convenient at any time for said purposes aforesaid subject to restoring asphalt or cement parking or driveway surface where necessary; over and within the following described property:

That portion of Parcel 3 of Parcel Map 18393, in the City of San Jacinto, County of Riverside, State of California, as shown by map recorded in Book 106, Pages 62, 63 and 64 of Parcel Maps, records of Riverside County, California, described as follows: Beginning at the corner of said Parcel 3; thence South 00°25'29" East 149.20 feet to the true point of beginning; thence South 89°34'31" East 5545 feet; thence South 00°25'29" East 20.00 feet; thence North 89°34'31" West 55.45 feet to the West line of said Parcel 3; thence North 00°25'29" West 20.00 feet to the point of beginning

Description of Wells:

State Well Number	**Popular Name or Reference Description**
04S01W31C002S	Van Dam Dairy Barn
04S01W31B001S	Van Dam Dairy East

DATED: December 12, 2012

[signature]
DONALD DICK VAN DAM, Trustee of the Donald Dick and Frances L. Van Dam Revocable Trust

DATED: December 12, 2012

Frances L. Van Dam
FRANCES L. VAN DAM, Trustee of the Donald Dick and Frances L. Van Dam Revocable Trust

EXHIBIT "C"
TO
STIPULATION FOR ENTRY OF JUDGMENT

ASSIGNMENT OF BASE PRODUCTION RIGHTS
and
ELECTION

Defendants DONALD DICK VAN DAM & FRANCES L. VAN DAM, Trustees of The Donald Dick & Frances L. Van Dam Revocable Family Trust, based on a collective assignment to said defendants of Base Production Rights under the proposed Stipulated Judgment in the amount of 531 acre feet per year collectively for all properties described on Exhibit "B," hereby elect to be classified collectively in these proceedings as

Class "A" Participants ____.

Class "B" Participants X.

(Select one)

DATED: December 12, 2012

[signature]
DONALD DICK VAN DAM, Trustee of the Donald Dick and Frances L. Van Dam Revocable Trust

DATED: December 12, 2012

[signature]
FRANCES L. VAN DAM, Trustee of the Donald Dick and Frances L. Van Dam Revocable Trust

19

GERALD D. SHOAF, SBN 41084
REDWINE AND SHERRILL
1950 MARKET ST.
RIVERSIDE, CA 92501
Telephone (951) 684-2520
Facsimile (951) 684-9583
Gshoaf@redwineandsherrill.com

Attorneys for Plaintiff
EASTERN MUNICIPAL WATER DISTRICT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF RIVERSIDE

EASTERN MUNICIPAL WATER DISTRICT, A California Municipal Water District, Plaintiff, vs. CITY OF HEMET; et al., Defendants.	CASE NO.: RIC 1207274 STIPULATION FOR ENTRY OF JUDGMENT

The parties hereto agree and stipulate as follows:

1. The following facts, considerations, and objectives, among others, provide the basis for this Stipulation for Entry of Judgment:

a. On May 16, 2012, the Eastern Municipal Water District commenced this action by filing a Complaint seeking the adjudication of an area within the San Jacinto Valley described in Exhibit "A" to the Complaint on file herein and known as the "Management Area." The Complaint alleges that the groundwater basins underlying the Management Area, to-wit, the Canyon, the San Jacinto Upper Pressure, and the Hemet North and Hemet South Basins are in a

state of overdraft and seeks correction of this condition by the Court through adjudication of certain rights to produce water therefrom.

b. Each of the parties executing this Stipulation has a direct interest in the quantity and quality of groundwater produced from within the Management Area.

c. The safe yield of the basins that comprise the Management Area is approximately 45,000 acre feet per year. For more than five years preceding the filing of the Complaint, the annual safe yield (as defined in Section 1.33 of the proposed Stipulated Judgment) of the groundwater under the Management Area has been exceeded by the total production therefrom, and a state of overdraft has existed continuously for at least five years. Groundwater production during this period has been open, notorious, continuous, adverse, hostile, and under a claim of right.

d. It is generally recognized and accepted that unmanaged downward decline in water levels has severe adverse impacts on the rights of groundwater producers and on water quality, will cause increased pumping lifts and may result in surface land subsidence.

e. It is apparent to the parties that protection of the rights of the parties and of the public interest in maximizing the beneficial use of a limited resource—groundwater supplies—within the Management Area requires the development, imposition and implementation of a physical solution.

2. The parties agree that the physical solution represented by the Water Management Plan set forth in the proposed Stipulated Judgment attached hereto as Exhibit "A," constitutes a fair and equitable basis for protection of the groundwater supply within the Management Area and for satisfaction of groundwater rights within said Management Area and is in furtherance of the mandate of the State Constitution establishing water policy within the State to maximize

beneficial use and avoid waste, and provides due consideration of the public interest and of the environment.

3. The parties agree that jurisdiction over each of the parties has been established by the allegations in the Complaint and that proper service of process of the Summons and Complaint upon each of the defendants has occurred.

4. The parties agree that the proper venue for this matter is the California Superior Court for the County of Riverside. The parties further agree that the Answers on behalf of all defendants appearing in this action have been filed, generally denying all allegations in the Complaint except those expressly admitted.

5. The parties agree that a Judgment in the form attached hereto as Exhibit "A" may be made and entered by the Court binding these stipulating parties in this action. Each Private Pumper defendant signing this Stipulation shall attach to this Stipulation as Exhibit "B," a signed description of said defendant's property within the Management Area, including the acreage thereof; and, as Exhibit "C," the signed form indicating said defendant's election to be classified as a Class "A" or Class "B" Participant.

6. Accordingly, the parties request that the Court hold a hearing to determine whether there is any objection to said proposed Judgment.

7. The parties agree that in the event that the Court is unwilling to enter a final judgment identical to the Judgment attached hereto as Exhibit "A," this Stipulation will have no binding effect upon any of the parties to this Stipulation, and shall be considered null and void. The parties further agree that in the event this Stipulation becomes null and void under this provision, all defendants will have thirty (30) days to file and serve amended responsive pleadings.

8. The parties agree that this Stipulation may be executed in counterparts, each of which will be filed with the Court.

PLAINTIFF:

DATED: ____________, 2012 EASTERN MUNICIPAL WATER DISTRICT

By________________________________

DEFENDANT:

DATED: ____________, 2012 LAKE HEMET MUNICIPAL WATER DISTRICT

By________________________________

DEFENDANT:

DATED: ____________, 2012 CITY OF HEMET

By________________________________

DEFENDANT:

DATED: ____________, 2012 CITY OF SAN JACINTO

By________________________________

DEFENDANTS/PUMPERS:

DATED: 02/26, 2013

UNITED AIRCRAFT SERVICES, INC.
a California Corporation

By: ______________________
Benjamin C. Warren
Its: President

DATED: 02/26, 2013

____
BENJAMIN C. WARREN, Trustee of the Warren Marital Trust dated October 2, 2010

EXHIBIT "B"

TO

STIPULATION FOR ENTRY OF JUDGMENT

Description of Defendant's Property and Wells Within the Management Area

Defendants, UNITED AIRCRAFT SERVICES, INC., a California Corporation, by Benjamin C. Warren, its President; and BENJAMIN C. WARREN, Trustee of the Warren Marital Trust dated October 2, 2010, certify that the following is a description of the property and wells owned by said defendants within the Management Area:

Description & Acreage of each Parcel:

All that certain real property situated in the County of Riverside, State of California, described as follows:

Parcel A: (APN, 432-280-006; Acres, 9.77)

The North 10 acres of the South 20 acres of the Northwest ¼ of Lot 160 of the lands of the San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as per map recorded in Book 8, Page 357, of Maps, Records of San Diego County, California.

Parcel B: (APN, 432-280-007; Acres, 9.77)

The Southerly 10 acres of the Northwest quarter of Farm Lot 160 of the Lands of the San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as shown by map on file in Book 8, Page 357, of Maps, Records of San Diego County, California.

Parcel C: (APN, 432-280-001; Acres 3.88)
(APN, 432-280- 002; Acres, 4.51)
(APN, 432-280- 003; Acres, 4.48)

Parcels 1, 2 and 3 of Parcel Map No. 5729, in the City San Jacinto, County of Riverside, State of California, on file in Book 13, Parcel Maps, Page 90, Riverside County Records;

Excepting therefrom that portion conveyed to the County of Riverside by deed recorded May 15, 1974 as Instrument No. 58675 of Official Records.

Parcel D: (APN, 432-280-004; Acres, 4.39)
(APN, 432-280- 005; Acres, 0.16)

That portion of the Northwest ¼ of Farm Lot 160 of the lands of the San Jacinto Land Association, in the City of San Jacinto, County of Riverside, State of California, as shown by map on file in Book 8 Page 357, of Maps, Records of San Diego County, California, described as follows:

Beginning at the Northeast corner of said Northwest ¼ of Farm Lot 160;

Thence West on the North line of said Northwest ¼, 654 feet;

Thence South on a line parallel to the East line of said Northwest ¼, 333.20 feet;

Thence East on a line parallel to the North line of said Quarter, 654 feet;

Thence North on the East line of said Northwest 1/4, 333.20 feet to the point of beginning.

Excepting therefrom the Northerly 30 feet thereof lying within Seventh Street.

Parcel E: (APN, 444-030-012; Acres, 6.1)

The Northerly rectangular ¾ of the North ½ of the Northeast Quarter of Farm Lot 165 of the lands of the San Jacinto Land Association, in the City of Hemet, in the County of Riverside, State of California, as per map recorded in Book 8, Page 357 of Maps, in the Office of the County Recorder of said County.

EXCEPT that portion lying East of the following described line

Beginning at a point in the center line of Esplanade Avenue, South 89° 58′ 42″ West, 750.03 feet from its intersection with the center line of Kirby Street;

Thence South 00° 12′ 53″ West, 495.92 feet to the Southerly line of above described property, said line being parallel with and 4.00 feet East of existing irrigating pipe lines.

Parcel F (APN, 444-030-016; Acres, 4.89)

The South one-fourth of the North half of the Northeast one-fourth of Farm Lot 165 of the lands of San Jacinto Land Association, as shown by Map on file in Book 8, Page 357 of Maps, San Diego Records.

Parcel G (APN, 444-030-018; Acres, 4.89)

The North half of the North half of the South half of the Northeast quarter of Farm Lot 165 of the lands of the San Jacinto Land Association, as shown by Map on file in Book 8, Page 357 of Maps, San Diego County Records.

Parcel H: (APN, 444-030-027; Acres, 30.43)

Being a portion of the Northwest quarter of Farm Lot 165 of the lands of the San Jacinto Land Association, County of Riverside, State of California, as per Map recorded in Book 8, Page 357 of Maps, in the Office of the County Recorder of San Diego County, being more particularly described as follows:

Beginning at the Northwest corner of said Farm Lot 165, said point also being the centerline intersection of Esplanade Avenue and Sanderson Avenue; thence North 89° 58′ 42″ East, 320.00 feet along the centerline of said Esplanade Avenue, also being the Northerly line of said Farm Lot 165, to the True Point of Beginning; thence continuing along the centerline of said Esplanade Avenue and Northerly line of said Farm Lot 165, North 89° 58′ 42″ East, 1,001.43 feet to the Northeast corner of the Northwest quarter of said Farm Lot 165; thence South 00° 00′ 29″ East, 1,323.26 feet along the Easterly line of the Northwest quarter of said Farm Lot 165 to a point of intersection with the Southerly line of the Northwest quarter of said Farm Lot 165, said point being the Southeast corner of the Northwest quarter of said Farm Lot 165; thence South 89° 57′ 55″ West, 1,001.81 feet to a line parallel with and 320.00 feet East, measured at right angles from the centerline of said Sanderson Avenue; thence North 00° 00′ 31″ East, 1323.49 feet along said parallel line to the True Point of Beginning.

Description of Wells:

State Well Number	**Popular Name or Reference Description**
04S01W32M001S	Hideaway Farms Cawston
05S01W05B001S	Warren's Thoroughbreds

DATED: 02/26, 2013

UNITED AIRCRAFT SERVICES, INC.
a California Corporation

By: ______________________
Benjamin C. Warren
Its: President

DATED: 02/26, 2013

____
BENJAMIN C. WARREN, Trustee of the Warren Marital Trust dated October 2, 2010

EXHIBIT "C"
TO
STIPULATION FOR ENTRY OF JUDGMENT

ASSIGNMENT OF BASE PRODUCTION RIGHTS
and
ELECTION

Defendants UNITED AIRCRAFT SERVICES, INC., a California Corporation, by Benjamin C. Warren, its President; and BENJAMIN C. WARREN, Trustee of the Warren Marital Trust dated October 2, 2010, based on a collective assignment to said defendants of Base Production Rights under the proposed Stipulated Judgment in the amount of 442 acre feet per year collectively for all properties described on Exhibit "B," hereby elect to be classified collectively in these proceedings as

Class "A" Participants ____.
Class "B" Participants XX.
(Select one)

DATED: 02/26, 2013

UNITED AIRCRAFT SERVICES, INC.
a California Corporation

By: ______________________
Benjamin C. Warren
Its: President

DATED: 02/26, 2013

____
BENJAMIN C. WARREN, Trustee of the Warren Marital Trust dated October 2, 2010

EXHIBIT C

EXHIBIT C

BASE PRODUCTION RIGHTS

1. Public Agencies

AGENCY NAME	Base Production Rights (Acre-feet per year)
Eastern Municipal Water District	10,869
Lake Hemet Municipal Water District	11,063
City of Hemet	6,320
City of San Jacinto	4,031

2. Class B Participants

NAME	BASE PRODUCTION RIGHTS	APN
BOERSMA (Eric Jon Boersma; Julie Ann Boersma; Peter Boersma, Trustee of the Peter & Rita Gayle Boersma Family Trust dated October 13, 1989; and Rita Gayle Boersma, Trustee of the Peter & Rita Gayle Boersma Family Trust dated October 13, 1989	195	425-100-005, Acres: 71.86 425-100-017, Acres: 7.23 425-200-003, Acres: 18.12 425-200-023, Acres: 3.61 425-210-004, Acres: 12.51 425-220-003, Acres: 14.38 425-100-019, Acres: 6.89 425-220-013, Acres: 0.27
BORUCHIN (the Amended and Restated John and Dora Boruchin Administrative Trust dated December 23, 2012, by Co-Trustee Rabbi Eliezer Gross and Co-Trustee Rex Johnson, as the successor-in-interest to John Boruchin, Trustee of the John and Dora Boruchin Living Trust dated December 15, 1981)	266	436-080-001 436-080-002 436-080-006

NAME	BASE PRODUCTION RIGHTS	APN
CURCI SAN JACINTO INVESTORS	260	434-230-003, Acres: 9.52 434-230-004, Acres: 9.52 433-110-020, Acres: 1.26 433-110-040, Acres: 4.62 (Portion) 434-190-007, Acres: 6.99 434-190-008, Acres: 1.61 433-070-051, Acres: 11.84 434-300-012, Acres: 3.81 434-300-016, Acres: 32.94 434-300-017, Acres: 6.31 (Portion) 434-300-013-0, Acres: 1.34 434-271-026, Acres: 9.52 434-250-002, Acres: 19.05
LAUDA FAMILY LIMITED PARTNERSHIP	3,530	425-080-033; 286.65 Acres 430-060-020; 145.59 Acres 430-110-009; 34.60 Acres 425-090-022; 46.59 Acres 425-200-019; 54.01 Acres 430-080-004; 122.00 Acres 430-080-010; 152.11 Acres 425-080-032; 84.95 Acres 430-050-010; 238.53 Acres 425-080-015; 149.13 Acres 423-240-008; 0.56 Acres 423-240-010; 75.29 Acres 425-080-018; 16.45 Acres 425-080-019; 11.74 Acres 425-080-038; 4.67 Acres 423-240-025; 18.92 Acres 423-240-026; 173.35 Acres 425-080-016; 101.52 Acres 425-090-023; 15.12 Acres 430-080-011; 18.80 Acres 425-200-020; 143.65 Acres 423-240-013 423-240-014 425-080-034 425-080-035; 2.85 Acres 425-080-036; 0.80 Acres
NUEVO DEVELOPMENT	151	425-120-011, Acres: 36.28
PASTIME LAKES INVESTMENT CO.	212	425-110-004, Acres: 0.81 425-110-008, Acres: 75.12 425-110-009, Acres: 45.11 425-110-016, Acres: 0.46

NAME	BASE PRODUCTION RIGHTS	APN
RANCHO DIAMANTE INVESTMENTS	166	465-140-021, Acres:12.43 (Portion) 465-140-035, Acres: 3.63 465-140-034, Acres: 7.82 465-140-014, Acres: 12.84 465-140-015, Acres: 12.55 465-140-001, Acres: 32.22 465-140-004, Acres: 9.00 465-140-024, Acres: 10.71 465-140-022, Acres: 7.90 465-140-002, Acres: 1.28
SAN JACINTO SPICE RANCH	265	433-110-004, Acres: 5.84 433-110-015, Acres: 4.81 433-110-021, Acres: 0.76 433-110-023, Acres: 0.02 433-110-025, Acres: 1.03 433-110-033, Acres: 2.86 433-110-034, Acres: 1.02 433-130-001, Acres: 1.41 433-130-020, Acres: 77.27 433-120-025, Acres: 13.67 433-120-026, Acres: 6.18 433-120-027, Acres: 0.33
SCOTT A.G. PROPERTIES, L.P.; SCOTT AG PROPERTY, L.P.	1,755	430-050-017; 1.69 Acres 430-050-018; 7.23 Acres 430-050-030; 69.01 Acres 430-050-031; 308.23 Acres 430-060-023; 12.84 Acres 430-060-024; 0.68 Acres 430-060-025; 20.61 Acres 425-080-012; 0.52 Acres 430-050-014; 43.25 Acres 430-060-019; 213.77 Acres 430-070-011; 140.69 Acres 436-110-014; 58.18 Acres 430-140-007; 3.46 Acres
VAN DAM (Donald Dick Van Dam, Trustee of the Donald Dick & Frances L. Van Dam Revocable Family Trust; & Frances L. Van Dam, Trustee of the Donald Dick & Frances L. Van Dam Revocable Family Trust)	531	432-180-004, Acres: 77.00 432-190-015, Acres: 0.02

NAME	BASE PRODUCTION RIGHTS	APN
WARREN/UNITED AIRCRAFT	442	432-280-006; 9.77 Acres 432-280-007; 9.77 Acres 432-280-001; 3.88 Acres 432-280-002; 4.51 Acres 432-280-003; 4.48 Acres 432-280-004; 4.39 Acres 432-280-005; 0.16 Acres 444-030-012; 6.10 Acres 444-030-016; 4.89 Acres 444-030-018; 4.89 Acres 444-030-027; 30.43 Acres

APPENDIX E

Public Comments on Draft GSP

The West San Jacinto GSA released the Draft GSP for public comment on April 16, 2021. The 90-day public review period closed July 15, 2021. The GSA received one formal comment letter co-authored by The Nature Conservancy, Audubon California, the Local Government Commission, the Union of Concerned Scientists, and Clean Water Action / Clean Water Fund. Additionally, the GSA received an email with a question regarding use of recycled water in the Plan Area. Both the formal letter and the email are included in this appendix. The formal letter included several requests for clarification or additional information regarding disadvantaged communities, interconnected surface water, groundwater dependent ecosystems, and climate change. These requests and the GSA's responses are found in a table following the formal letter. The email and response, which did not require modification to the Draft GSP, follow the formal letter and table of responses.

July 15, 2021

Eastern Municipal Water District
Water Resources Planning
P.O. Box 8300
Perris, CA 92572-8300
Submitted via email: grayr@emwd.org

Re: Public Comment Letter for the San Jacinto Groundwater Basin Draft GSP

Dear Rachel Gray,

On behalf of the above-listed organizations, we appreciate the opportunity to comment on the Draft Groundwater Sustainability Plan (GSP) for the San Jacinto Groundwater Basin being prepared under the Sustainable Groundwater Management Act (SGMA). Our organizations are deeply engaged in and committed to the successful implementation of SGMA because we understand that groundwater is critical for the resilience of California's water portfolio, particularly in light of changing climate. Under the requirements of SGMA, Groundwater Sustainability Agencies (GSAs) must consider the interests of all beneficial uses and users of groundwater, including drinking water users, environmental users, surface water users, federal government, California Native American tribes and disadvantaged communities (Water Code 10723.2).

As stakeholder representatives for beneficial users of groundwater, our GSP review focuses on how well disadvantaged communities, drinking water users, tribes, climate change, and the environment were addressed in the GSP. While we appreciate that some basins have consulted us directly via focus groups, workshops, and working groups, we are providing public comment letters to all GSAs as a means to engage in the development of 2022 GSPs across the state. Recognizing that GSPs are complicated and resource intensive to develop, the intention of this letter is to provide constructive stakeholder feedback that can improve the GSP prior to submission to the State.

Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings:

1. Beneficial uses and users **are not sufficiently** considered in GSP development.
    a. Human Right to Water considerations **are not sufficiently** incorporated.
    b. Public trust resources **are not sufficiently** considered.
    c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed.
2. Climate change **is not sufficiently** considered.
3. Data gaps **are not sufficiently** identified and the GSP **does not have plans** to eliminate them.

4. Projects and Management Actions **do not sufficiently consider** potential impacts or benefits to beneficial uses and users.

Our specific comments related to the deficiencies of the San Jacinto Groundwater Basin Draft GSP, along with recommendations on how to reconcile them, are provided in detail in **Attachment A.**

Please refer to the enclosed list of attachments for additional technical recommendations:

Attachment A	GSP Specific Comments
Attachment B	SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users
Attachment C	Freshwater species located in the basin
Attachment D	The Nature Conservancy's "Identifying GDEs under SGMA: Best Practices for using the NC Dataset"

Thank you for fully considering our comments as you finalize your GSP.

Best Regards,

Ngodoo Atume
Water Policy Analyst
Clean Water Action/Clean Water Fund

J. Pablo Ortiz-Partida, Ph.D.
Western States Climate and Water Scientist
Union of Concerned Scientists

Samantha Arthur
Working Lands Program Director
Audubon California

Danielle V. Dolan
Water Program Director
Local Government Commission

E.J. Remson
Senior Project Director, California Water Program
The Nature Conservancy

Melissa M. Rohde
Groundwater Scientist
The Nature Conservancy

Attachment A

Specific Comments on the San Jacinto Draft Groundwater Sustainability Plan

1. Consideration of Beneficial Uses and Users in GSP development

Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes, groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine.

A. Identification of Key Beneficial Uses and Users

Disadvantaged Communities and Drinking Water Users

The identification of Disadvantaged Communities (DACs) and drinking water users is **incomplete**. While the GSP provides basic information on DACs, including identification by name and location on a map (Figure 2-9) as determined by the California Department of Water Resources' DAC Mapping Tool, and description of the size of the population in each DAC (Table 2-9), the plan fails to identify the population dependent on groundwater as their source of drinking water in these communities. The plan also fails to provide location and depth of domestic wells within the basin. These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, to support the development of water budgets using the best available information, and to support the development of sustainable management criteria, and projects and management actions that are protective of these users.

RECOMMENDATIONS
• Include map and inventory of the location of all domestic wells by location and by depth. • Identify the sources of drinking water for DAC members, including an estimate of how many people rely on groundwater (e.g., domestic wells, state small water systems, and public water systems). The GSP states that "Disadvantaged Communities (DACs) within the Plan Area receive water from cities, mutual water companies, or EMWD". However the GSP does not currently provide clear information on how and to what extent DAC members rely on groundwater.

Interconnected Surface Waters

The identification of Interconnected Surface Waters (ISW) is **insufficient**. The GSP incorrectly excluded stream segments as ISWs based on lack of continuous saturation between surface and groundwater or the existence of ephemeral streams. However, there were significant data gaps, including data from multiple seasons and water year types, in the groundwater level data used in the mapping effort. The regulations [23 CCR §351(o)] define ISW as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water. Because of the exclusion of stream segments, potential ISW are not being managed in the GSP. Until a disconnection can be proven, include all potential ISW in the GSP. This is necessary to assess whether surface water depletions caused by groundwater use are having an adverse impact on environmental beneficial users of surface water

RECOMMENDATIONS

- Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth to groundwater contours across the landscape. This will provide accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.
- Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate, when mapping ISWs.
- Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

Groundwater Dependent Ecosystems

The identification of Groundwater Dependent Ecosystems (GDEs) is **insufficient**. The GSP took initial steps to identify and map GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset). However, we found that some mapped features in the NC dataset were improperly disregarded, as described below.

- Mapped features in the NC dataset were disregarded if Normalized Difference Vegetation Index (NDVI) and Normalized Difference Moisture Index (NDMI) data downloaded from TNC's GDE Pulse Tool did not correlate with groundwater. This is an incorrect method, since a lack of a relationship does not preclude that groundwater is providing some of the ecosystem's water needs. If the ecosystem is tapping into shallow groundwater then the ecosystem should be categorized as a GDE. If there are no data to characterize groundwater conditions in the shallow principal aquifer, then the GDE should be retained as a potential GDE and data gaps reconciled in the Monitoring Network section of the GSP. Please note that the GSP Regulations define principal aquifers as "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems." [23 CCR §351(aa)] regardless of pumping rates. Shallow aquifers that have the potential to support well development, support ecosystems, or provide baseflow to streams are principal aquifers; even if the majority of the basin's pumping is occurring in deeper principal aquifers.
- GDEs were disregarded based on the presence or proximity of surface water. However, partial reliance on surface water does not necessarily prove that the plants and animals do not access groundwater. Many GDEs often simultaneously rely on multiple sources of water (i.e., both groundwater and surface water), or shift their reliance on different sources on an interannual or inter-seasonal basis. Additionally, adverse impacts can occur to GDEs due to pumping that further separates groundwater from surface water.

RECOMMENDATIONS
• Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a DEM to estimate depth to groundwater contours across the landscape. • If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network. • In addition to describing the vegetation and wetland communities from the NC dataset in the GSP area (as provided in Tables 1-4 in Appendix J), please also provide an inventory, map, or description of fauna (e.g., birds, fish, amphibian) species in the basin and note any threatened or endangered species (see Appendix C in this letter for a list of freshwater species located in the San Jacinto groundwater basin).

Native Vegetation and Managed Wetlands

Native vegetation and managed wetlands are water use sectors that are required[1,2] to be included into the water budget. The integration of these ecosystems into the water budget is **insufficient**. The water budget did not include the current, historical, and projected demands of native vegetation and managed wetlands (including the California Department of Fish and Wildlife's San Jacinto Wildlife Area). Groundwater losses due to evapotranspiration were not explicitly measured or modeled but instead were implicitly accounted for during development and calibration of the groundwater model. The omission of explicit water demands for native vegetation and managed wetlands is problematic because key environmental uses of groundwater are not being accounted for as water supply decisions are made using this budget, nor will they likely be considered in project and management actions.

RECOMMENDATION
• Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector, including native vegetation and managed wetlands.

[1] "'Water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation." [23 CCR §351(al)]
[2] "The water budget shall quantify the following, either through direct measurements or estimates based on data: (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow." [23 CCR §354.18]

B. Engaging Stakeholders

Stakeholder Engagement during GSP development

Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders[3] is not fully met by the description in the Public Outreach and Engagement Plan included in the GSP as Appendix F. This engagement plan presents only the bare minimum information and stakeholder engagement is primarily via public notification on the GSP website and interested parties email list.

- The opportunities for public involvement and engagement are limited to EMWD regular board meetings, SAG meetings and review of the EMWD website.

- The Stakeholder Advisory Group comprises mainly water utilities serving DACs. There are currently no DAC community members or private well owner representatives included in the Stakeholder Advisory Group. The plan states that "DAC community representatives are on the list of interested parties and the stakeholder advisory group (SAG) list of invitees". Similarly, the California Department of Fish and Wildlife was the only environmental stakeholder included in the Stakeholder Advisory Group during the GSP development process. The GSA has held only 6 Stakeholder Advisory Group meetings since 2015. We are concerned that this level of engagement is not sufficient to adequately engage and involve all beneficial users of groundwater.

- The Public Outreach and Engagement plan does not include a plan for continual opportunities for engagement through the implementation phase of the GSP for DACs or environmental stakeholders. The public outreach and engagement plan infers that stakeholders will be notified via public notification on the GSP websites and interested parties email lists.

- The GSP states that the GSA will communicate with domestic water-well owners to ensure that they understand their on-going opportunity to participate in development of the GSP. There is no documentation of how the GSA is carrying out this engagement. Similarly, the GSP states that EMWD works with DACs on other programs and will continue to coordinate with DACs within the GSA boundary. However, the plan fails to provide specific details on how they plan to conduct this outreach and engagement.

RECOMMENDATIONS
• Include a more detailed and robust Public Outreach and Engagement Plan that details how DAC community members and environmental stakeholders will be targeted and engaged during the remainder of the GSP development process and throughout the GSP implementation phase. • Conduct outreach at frequented locations such as farmers markets, schools across the plan area providing translation services and technical assistance where needed. Refer to Attachment B for specific recommendations on how to actively engage community stakeholders.

C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users

[3] "A communication section of the Plan shall include a requirement that the GSP identify how it encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin." [23 CCR §354.10(d)(3)]

The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results[4] and establishing minimum thresholds[5,6]

Disadvantaged Communities and Drinking Water Users

Many DACs rely on small public water systems, which are shallower and have very different characteristics from agricultural wells or larger urban water supply wells, and thus are more vulnerable to changes in water level and water quality. Additionally, because the location of domestic wells is not provided in the GSP, the impacts to the domestic well user population are unknown. The GSP neither describes nor analyzes direct or indirect impacts on DACs or domestic drinking wells when defining undesirable results for chronic lowering of groundwater levels or water quality. Therefore, the SMC provided in the GSP are not protective of DACs or domestic drinking wells.

RECOMMENDATIONS

Chronic Lowering of Groundwater Levels

- Calculate and present on maps the anticipated change in water levels for measurable objectives and minimum thresholds relative to current groundwater conditions. These maps should clearly identify the locations of beneficial users, including DACs, populations dependent on domestic wells for drinking water, and small community water systems.
- Identify the location and number of domestic wells that would be anticipated to be impacted at the measurable objectives and minimum thresholds, utilizing well construction information available in DWR's Well Completion Report Map Application. Include an estimate of the population anticipated to be affected under these conditions. In order to mitigate against the undesirable result of community members losing access to drinking water, GSAs should identify a program to mitigate such impacts to these beneficial users.

Water Quality

- The plan only sets Minimum Thresholds (MTs) and Measurable Objectives (MOs) for total dissolved solutes (TDS). The GSA should set MTs and MOs for nitrates and ensure they align with drinking water standards[7].
- We recommend that the GSA provide distinct maps for VOC, nitrate and perchlorate contamination plumes as required in SGMA regulations[8].

Groundwater Dependent Ecosystems and Interconnected Surface Waters

Sustainable management criteria provided in the GSP do not consider potential impacts to environmental beneficial users. The GSP neither describes nor analyzes direct or indirect impacts on environmental users of groundwater or surface water when defining undesirable results. This

[4] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results." [23 CCR §354.26(b)(3)]

[5] "The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[6] "The description of minimum thresholds shall include [...] how state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the agency shall explain the nature of and the basis for the difference." [23 CCR §354.28(b)(5)]

[7] "Degraded Water Quality [...] collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues." [23 CCR §354.34(c)(4)]

[8] "Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes." [23 CCR §354.16(d)]

is problematic because without identifying potential impacts to GDEs and beneficial users of interconnected surface waters, minimum thresholds may compromise, or even irreparably destroy, environmental beneficial users. Since GDEs and managed wetlands are present in the basin, they must be considered when developing SMC for the basin. The comments above provide recommendations for re-evaluating the extent of GDEs and ISW in the basin.

RECOMMENDATIONS

- When defining undesirable results for chronic lowering of groundwater levels, water quality, and depletions of interconnected surface waters, please provide more specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results occur when 'significant and unreasonable' effects on beneficial users are caused by groundwater. Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the basin. Without defining undesirable results, the minimum thresholds cannot be determined. Potential effects on all beneficial users of groundwater in the basin need to be taken into consideration when defining undesirable results[9], establishing minimum thresholds[10], and the impacts to beneficial users of selected minimum thresholds must be analyzed.

- For the interconnected surface water SMC, the undesirable results should include a description of potential impacts on instream habitats within ISWs when defining minimum thresholds in the basin[11]. The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts to environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP (See Appendix B for a list of freshwater species in your basin). These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law[6,12].

[9] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results". [23 CCR §354.26(b)(3)]
[10] The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]
[11] "The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results." [23 CCR §354.28(c)(6)]
[12] Rohde MM, Seapy B, Rogers R, Castañeda X, editors. 2019. Critical Species LookBook: A compendium of California's threatened and endangered species for sustainable groundwater management. The Nature Conservancy, San Francisco, California. Available at:
https://groundwaterresourcehub.org/public/uploads/pdfs/Critical_Species_LookBook_91819.pdf

2. Climate Change

The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations[13] require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.

The integration of climate change into the projected water budget is **insufficient**. The GSP does incorporate climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the GSP did not consider the 2070 wet and 2070 extremely dry climate scenarios in the projected water budget. The GSP should clearly and transparently incorporate the extremely wet and dry scenarios provided by DWR into projected water budgets or select more appropriate extreme scenarios for their basins. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant, therefore they should be included in groundwater planning.

The sustainable yield is based on the historical water budget, which was augmented by several decades of imported water. It is unlikely that imported water allocations from the past will persist into the future under climate change. The GSP could be improved by more clearly documenting how climate change was incorporated into surface water flow inputs for the projected water budget, particularly for streamflow and imported water from the Colorado River Aqueduct and State Water Project.

If the water budgets are incomplete, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems and domestic well owners.

RECOMMENDATIONS

- Integrate climate change, including extreme wet and dry scenarios, into all elements of the projected water budget to form the basis for development of sustainable management criteria and projects and management actions.
- Document how climate change was incorporated into surface water flow inputs for the projected water budget.
- The sustainable yield should be based on the projected water budget with climate change incorporated.
- Incorporate climate change scenarios into projects and management actions.

[13] "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow." [23 CCR §354.18(e)]

3. Data Gaps

The consideration of beneficial users when establishing monitoring networks is **insufficient**. Our comments above note data gaps in the shallow monitoring networks for GDEs, ISWs, and DACs. The GSP fails to provide justification for having only 11 representative monitoring points across the plan area thereby failing to meet SGMA's requirements[14]. The lack of shallow monitoring wells and/or the lack of plans for future monitoring threatens GDEs, aquatic habitats, surface water users and shallow domestic well water. Potential GDEs are located in areas of the subbasin where no shallow groundwater monitoring currently exists or is proposed, leaving data gaps unfilled. Potential ISWs have been dismissed in the GSP, without proposed recommendations to improve ISW identification, mapping, and estimates of depletions. Appropriate monitoring is necessary so that groundwater conditions within GDEs and ISWs are characterized and surface-shallow groundwater interactions are fully integrated into the GSP.

RECOMMENDATIONS

- Provide maps that overlay monitoring well locations with the locations of DACs and GDEs to clearly identify potentially impacted areas.
- Reconcile data gaps in the monitoring network by evaluating how the gathered data will be used to identify and map GDEs and ISWs, and identify DACs and shallow domestic well users that are vulnerable to undesirable results.
- Increase the number of representative monitoring points (RMPs) across the basin for all groundwater condition indicators. Prioritize proximity to DACs and drinking water users when identifying new RMPs.
- Determine what ecological monitoring can be used to assess the potential for significant and unreasonable impacts to GDEs or ISWs due to groundwater conditions in the subbasin.

4. Addressing Beneficial Users in Projects and Management Actions

The consideration of beneficial users when developing projects and management actions is **insufficient.** The GSP states that projects and management actions are not necessary to achieve sustainability in the Plan Area, which has experienced rising groundwater levels and increased groundwater in storage over the past 30 years due to imported water supplies. Thus, the project and management actions proposed are not being implemented until undesirable results occur and the sustainable yield (which was incorrectly based on the historic water budget versus the projected water budget) is reached. The plan fails to meet SGMA requirements[15] by stating that public notice will not be required for some of the identified projects and management actions.

[14] "The monitoring network objectives shall be implemented to accomplish the following: [...] (2) Monitor impacts to the beneficial uses or users of groundwater." [23 CCR §354.34(b)(2)]

[15] "Each Plan shall include a description of the projects and management actions that include the following: the process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken." [23 CCR §354.44(b)(1)(B))]

RECOMMENDATIONS

Because GDEs, aquatic habitats, surface water users, DACs, and shallow domestic well water users were not sufficiently identified in the GSP, please consider including the following related to potential project and management actions in the GSP:

- For GDEs and ISWs, recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For guidance on how to integrate multi-benefit recharge projects into your GSP refer to the "Multi-Benefit Recharge Project Methodology Guidance Document"[16].

- For all beneficial users, provide public notice and engagement before consideration and implementation of the three management actions and two projects identified.

- For DACs, monitor the impacts of selected management actions and projects on communities and drinking water users.

- For DACs and domestic well owners, implement a drinking water well mitigation program to avoid the significant and unreasonable loss of drinking water. This could include a combination of replacing impacted wells with new, deeper wells and/or connecting domestic users to a public water system.

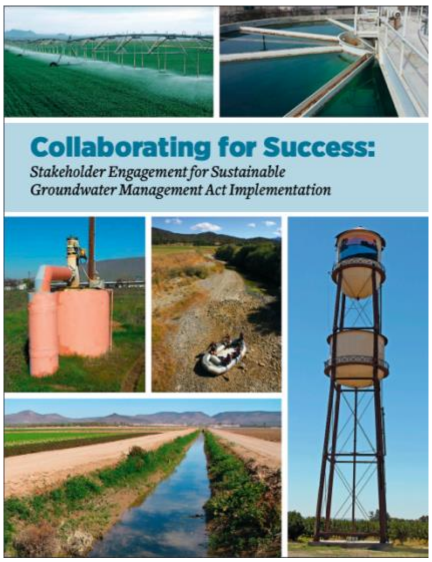
- For DACs, a discussion of whether potential impacts to water quality from projects and management actions could occur.

- Develop management actions to prevent future undesirable results that incorporate climate and water delivery uncertainties and address water demand.

[16] The Nature Conservancy. 2021. Multi-Benefit Recharge Project Methodology for Inclusion in Groundwater Sustainability Plans. Sacramento. Available at: https://groundwaterresourcehub.org/sgma-tools/multi-benefit-recharge-project-methodology-guidance/

Attachment B
SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users

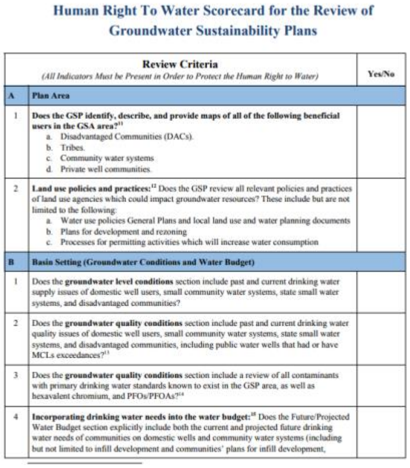
Stakeholder Engagement and Outreach



Clean Water Action, Community Water Center and Union of Concerned Scientists developed a guidance document called Collaborating for success: Stakeholder engagement for Sustainable Groundwater Management Act Implementation. It provides details on how to conduct targeted and broad outreach and engagement during Groundwater Sustainability Plan (GSP) development and implementation. Conducting a targeted outreach involves:

- Developing a robust Stakeholder Communication and Engagement plan that includes outreach at frequented locations (schools, farmers markets, religious settings, events) across the plan area to increase the involvement and participation of disadvantaged communities, drinking water users and the environmental stakeholders.
- Providing translation services during meetings and technical assistance to enable easy participation for non-English speaking stakeholders.
- GSP should adequately describe the process for requesting input from beneficial users and provide details on how input is incorporated into the GSP.

The Human Right to Water

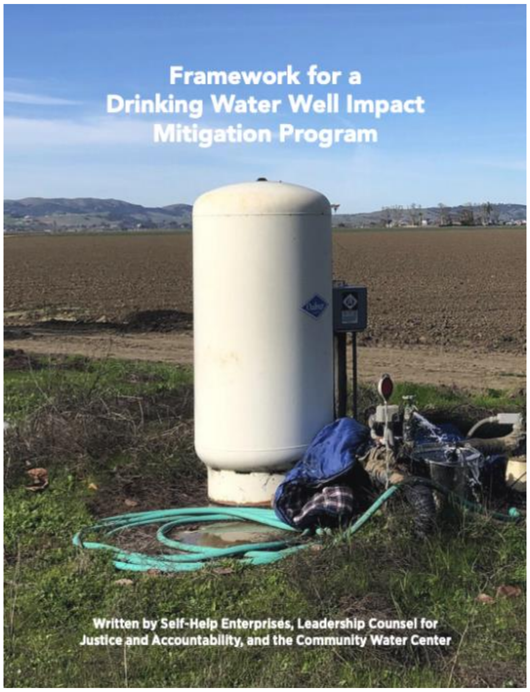


Human Right To Water Scorecard for the Review of Groundwater Sustainability Plans

	Review Criteria *(All Indicators Must be Present in Order to Protect the Human Right to Water)*	Yes/No
A	**Plan Area**	
1	**Does the GSP identify, describe, and provide maps of all of the following beneficial users in the GSA area?**[11] a. Disadvantaged Communities (DACs). b. Tribes. c. Community water systems d. Private well communities.	
2	**Land use policies and practices:**[12] Does the GSP review all relevant policies and practices of land use agencies which could impact groundwater resources? These include but are not limited to the following: a. Water use policies General Plans and local land use and water planning documents b. Plans for development and rezoning c. Processes for permitting activities which will increase water consumption	
B	**Basin Setting (Groundwater Conditions and Water Budget)**	
1	Does the **groundwater level conditions** section include past and current drinking water supply issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities?	
2	Does the **groundwater quality conditions** section include past and current drinking water quality issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities, including public water wells that had or have MCLs exceedances?[13]	
3	Does the **groundwater quality conditions** section include a review of all contaminants with primary drinking water standards known to exist in the GSP area, as well as hexavalent chromium, and PFOs/PFOAs?[14]	
4	**Incorporating drinking water needs into the water budget:**[15] Does the Future/Projected Water Budget section explicitly include both the current and projected future drinking water needs of communities on domestic wells and community water systems (including but not limited to infill development and communities' plans for infill development,	

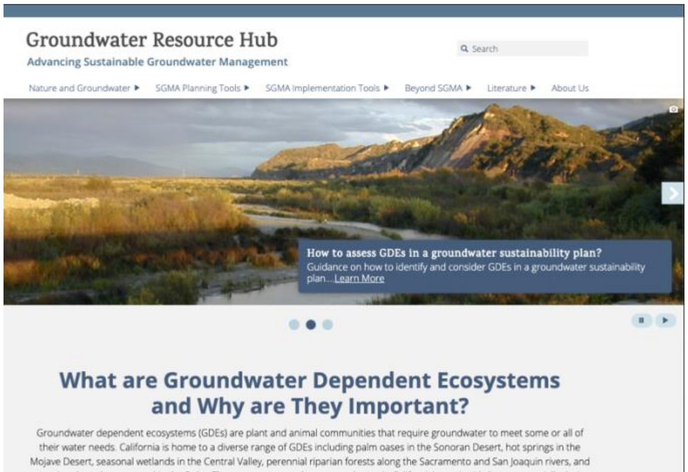
The Human Right to Water Scorecard was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid Groundwater Sustainability Agencies (GSAs) in prioritizing drinking water needs in SGMA. The scorecard identifies elements that must exist in GSPs to adequately protect the Human Right to Drinking water.

Drinking Water Well Impact Mitigation Framework



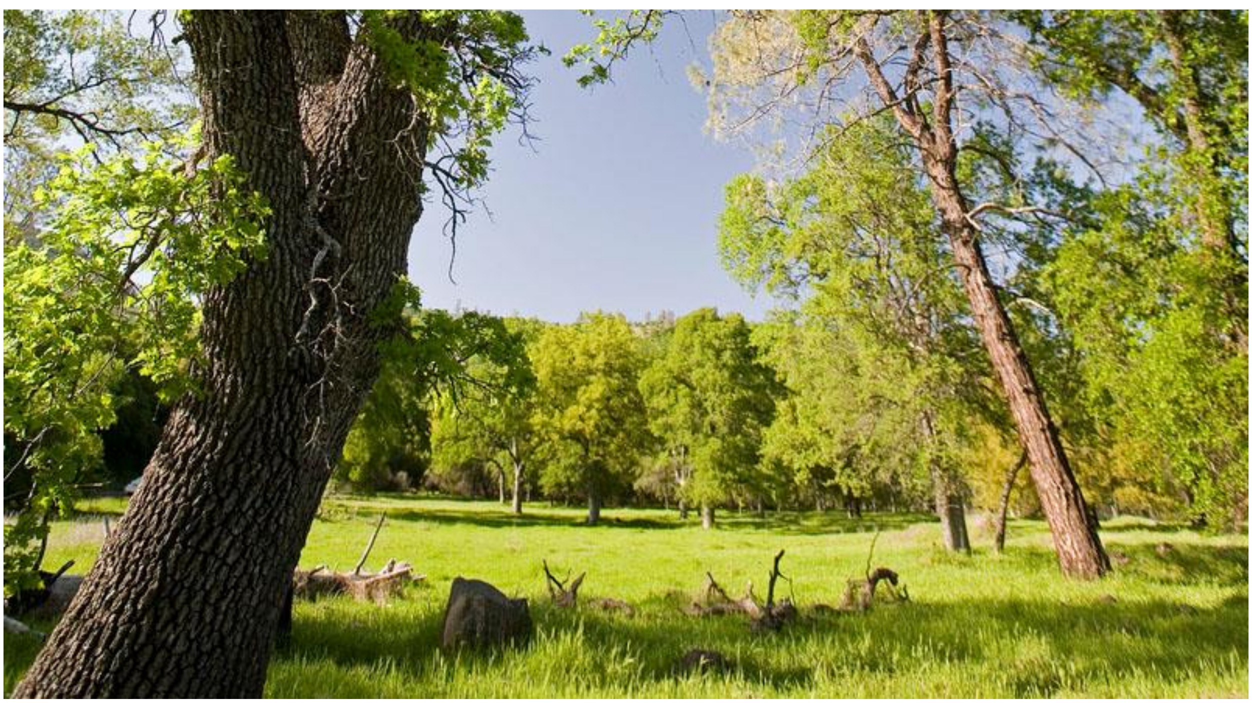
The Drinking Water Well Impact Mitigation Framework was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid GSAs in the development and implementation of their GSPs. The framework provides a clear roadmap for how a GSA can best structure its data gathering, monitoring network and management actions to proactively monitor and protect drinking water wells and mitigate impacts should they occur.

Groundwater Resource Hub



The Nature Conservancy has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at GroundwaterResourceHub.org. The Nature Conservancy's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Rooting Depth Database



The Plant Rooting Depth Database provides information that can help assess whether groundwater-dependent vegetation are accessing groundwater. Actual rooting depths will depend on the plant species and site-specific conditions, such as soil type and availability of other water sources. Site-specific knowledge of depth to groundwater combined with rooting depths will help provide an understanding of the potential groundwater levels are needed to sustain GDEs.

How to use the database

The maximum rooting depth information in the Plant Rooting Depth Database is useful when verifying whether vegetation in the Natural Communities Commonly Associated with Groundwater (NC Dataset) are connected to groundwater. A 30 ft depth-to-groundwater threshold, which is based on averaged global rooting depth data for phreatophytes[1], is relevant for most plants identified in the NC Dataset since most plants have a max rooting depth of less than 30 feet. However, it is important to note that deeper thresholds are necessary for other plants that have reported maximum root depths that exceed the averaged 30 feet threshold, such as valley oak (*Quercus lobata*), Euphrates poplar (*Populus euphratica*), salt cedar (*Tamarix spp.*), and shadescale (*Atriplex confertifolia*). The Nature Conservancy advises that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to groundwater threshold of 80 feet should be used instead of the 30 ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to re-emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

The Plant Rooting Depth Database is an Excel workbook composed of four worksheets:

1. California phreatophyte rooting depth data (included in the NC Dataset)
2. Global phreatophyte rooting depth data
3. Metadata
4. References

How the database was compiled

The Plant Rooting Depth Database is a compilation of rooting depth information for the groundwater-dependent plant species identified in the NC Dataset. Rooting depth data were compiled from published scientific literature and expert opinion through a crowdsourcing campaign. As more information becomes available, the database of rooting depths will be updated. Please Contact Us if you have additional rooting depth data for California phreatophytes.

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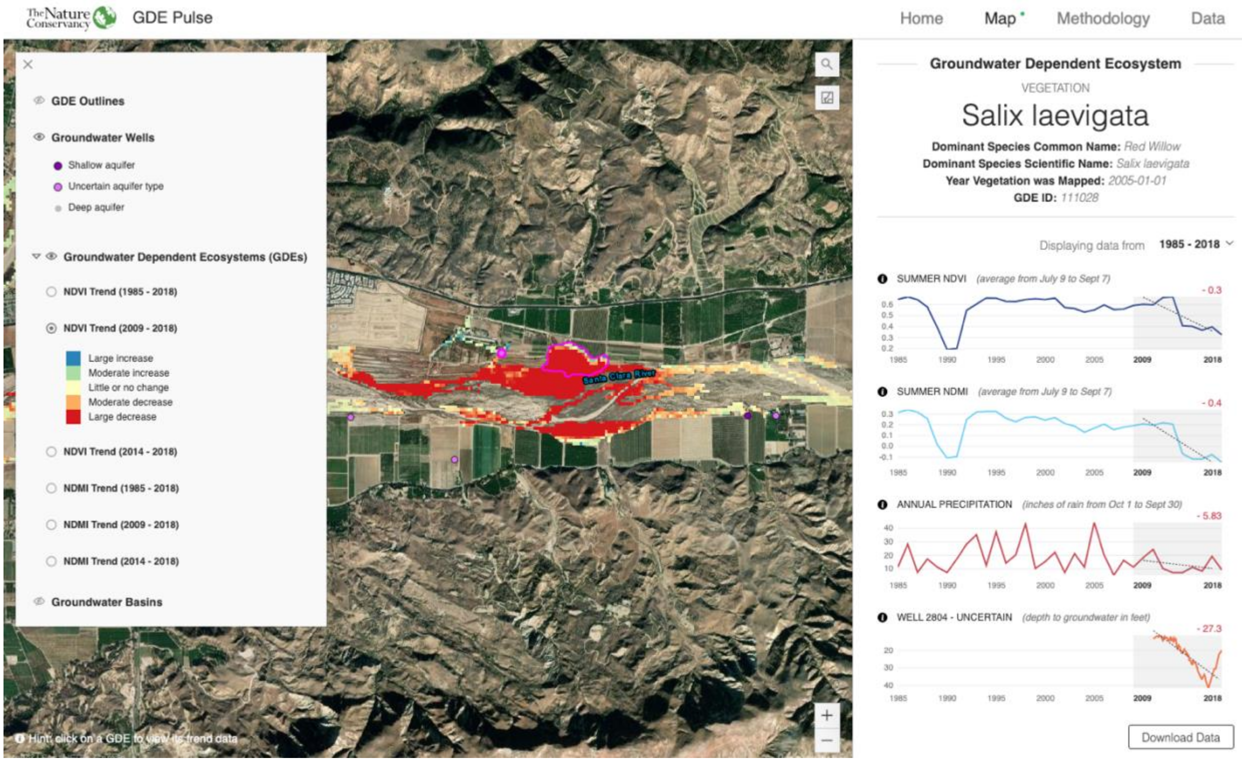
[1] Canadell, J., Jackson, R.B., Ehleringer, J.B. et al. 1996. Maximum rooting depth of vegetation types at the global scale. Oecologia 108, 583–595. https://doi.org/10.1007/BF00329030

GDE Pulse



[GDE Pulse](#) is a free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset. The following datasets are available for downloading:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

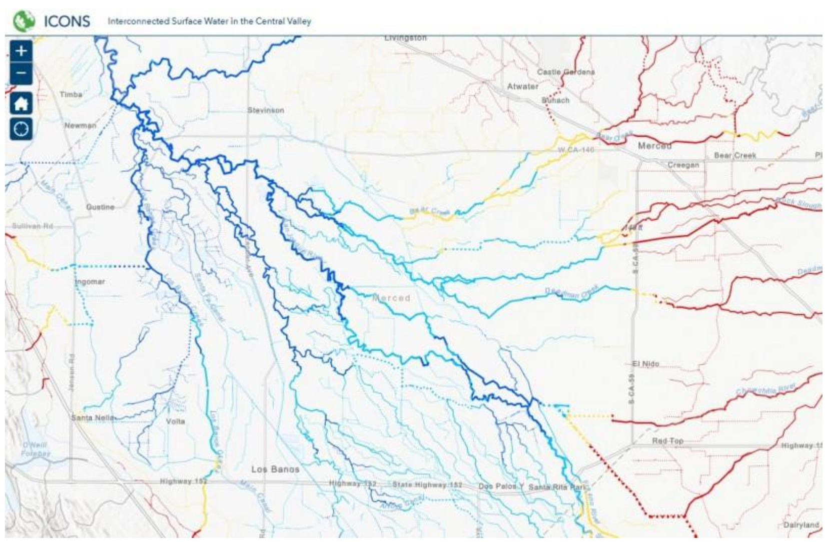
Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

ICONOS Mapper

Interconnected Surface Water in the Central Valley



ICONS maps the likely presence of interconnected surface water (ISW) in the Central Valley using depth to groundwater data. Using data from 2011-2018, the ISW dataset represents the likely connection between surface water and groundwater for rivers and streams in California's Central Valley. It includes information on the mean, maximum, and minimum depth to groundwater for each stream segment over the years with available data, as well as the likely presence of ISW based on the minimum depth to groundwater. The Nature Conservancy developed this database, with guidance and input from expert academics, consultants, and state agencies.

We developed this dataset using groundwater elevation data available online from the California Department of Water Resources (DWR). DWR only provides this data for the Central Valley. For GSAs outside of the valley, who have groundwater well measurements, we recommend following our methods to determine likely ISW in your region. The Nature Conservancy's ISW dataset should be used as a first step in reviewing ISW and should be supplemented with local or more recent groundwater depth data.

Attachment C

Freshwater Species Located in the San Jacinto Subbasin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result "depletion of interconnected surface waters", this attachment provides a list of freshwater species located in the San Jacinto Subbasin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the basin boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015[1]. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife's BIOS[2] as well as on The Nature Conservancy's science website[3].

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
BIRDS				
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Vireo bellii pusillus	Least Bell's Vireo	Endangered	Endangered	
Actitis macularius	Spotted Sandpiper			
Aechmophorus clarkii	Clark's Grebe			
Aechmophorus occidentalis	Western Grebe			
Aix sponsa	Wood Duck			
Anas acuta	Northern Pintail			
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas crecca	Green-winged Teal			
Anas cyanoptera	Cinnamon Teal			
Anas discors	Blue-winged Teal			
Anas platyrhynchos	Mallard			
Anas strepera	Gadwall			
Anser albifrons	Greater White-fronted Goose			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Aythya affinis	Lesser Scaup			
Aythya americana	Redhead		Special Concern	BSSC - Third priority
Aythya collaris	Ring-necked Duck			

[1] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710

[2] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS

[3] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

Aythya marila	Greater Scaup			
Aythya valisineria	Canvasback		Special	
Botaurus lentiginosus	American Bittern			
Bucephala albeola	Bufflehead			
Bucephala clangula	Common Goldeneye			
Butorides virescens	Green Heron			
Calidris alpina	Dunlin			
Calidris mauri	Western Sandpiper			
Calidris minutilla	Least Sandpiper			
Chen caerulescens	Snow Goose			
Chen rossii	Ross's Goose			
Chlidonias niger	Black Tern		Special Concern	BSSC - Second priority
Chroicocephalus philadelphia	Bonaparte's Gull			
Cistothorus palustris palustris	Marsh Wren			
Cygnus columbianus	Tundra Swan			
Cypseloides niger	Black Swift	Bird of Conservation Concern	Special Concern	BSSC - Third priority
Dendrocygna bicolor	Fulvous Whistling-Duck		Special Concern	BSSC - First priority
Egretta thula	Snowy Egret			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Empidonax traillii brewsteri	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Gallinula chloropus	Common Moorhen			
Gelochelidon nilotica vanrossemi	Gull-billed Tern	Bird of Conservation Concern	Special Concern	BSSC - Third priority
Grus canadensis	Sandhill Crane			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Himantopus mexicanus	Black-necked Stilt			
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority

Ixobrychus exilis hesperis	Western Least Bittern		Special Concern	BSSC - Second priority
Limnodromus scolopaceus	Long-billed Dowitcher			
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Mergus serrator	Red-breasted Merganser			
Numenius americanus	Long-billed Curlew			
Numenius phaeopus	Whimbrel			
Nycticorax nycticorax	Black-crowned Night-Heron			
Oxyura jamaicensis	Ruddy Duck			
Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Phalaropus tricolor	Wilson's Phalarope			
Pipilo aberti	Abert's Towhee			
Piranga rubra	Summer Tanager		Special Concern	BSSC - First priority
Plegadis chihi	White-faced Ibis		Watch list	
Pluvialis squatarola	Black-bellied Plover			
Podiceps nigricollis	Eared Grebe			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			
Rallus limicola	Virginia Rail			
Recurvirostra americana	American Avocet			
Riparia riparia	Bank Swallow		Threatened	
Rynchops niger	Black Skimmer			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa semipalmata	Willet			
Tringa solitaria	Solitary Sandpiper			
Vireo bellii	Bell's Vireo			
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEANS				
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Cambaridae fam.	Cambaridae fam.			

Hyalella spp.	Hyalella spp.			
Streptocephalus woottoni	Riverside Fairy Shrimp	Endangered	Special	IUCN - Endangered
HERPS				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Anaxyrus californicus	Arroyo Toad	Endangered	Special Concern	ARSSC
Pseudacris cadaverina	California Treefrog			ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Thamnophis hammondii hammondii	Two-striped Gartersnake		Special Concern	ARSSC
Thamnophis sirtalis sirtalis	Common Gartersnake			
Anaxyrus boreas halophilus	California Toad			ARSSC
Pseudacris regilla	Northern Pacific Chorus Frog			
INSECTS & OTHER INVERTS				
Ablabesmyia spp.	Ablabesmyia spp.			
Aeshna spp.	Aeshna spp.			
Agapetus spp.	Agapetus spp.			
Alotanypus spp.	Alotanypus spp.			
Apedilum spp.	Apedilum spp.			
Argia spp.	Argia spp.			
Argia vivida	Vivid Dancer			
Baetidae fam.	Baetidae fam.			
Baetis adonis	A Mayfly			
Baetis spp.	Baetis spp.			
Berosus spp.	Berosus spp.			
Brillia spp.	Brillia spp.			
Callibaetis spp.	Callibaetis spp.			
Chironomidae fam.	Chironomidae fam.			
Chironomus spp.	Chironomus spp.			
Coenagrionidae fam.	Coenagrionidae fam.			
Corixidae fam.	Corixidae fam.			
Cricotopus spp.	Cricotopus spp.			

Cyphomella spp.	Cyphomella spp.			
Dicrotendipes spp.	Dicrotendipes spp.			
Dytiscidae fam.	Dytiscidae fam.			
Endochironomus spp.	Endochironomus spp.			
Ephemerellidae fam.	Ephemerellidae fam.			
Ephydridae fam.	Ephydridae fam.			
Erpetogomphus spp.	Erpetogomphus spp.			
Fallceon quilleri	A Mayfly			
Fallceon spp.	Fallceon spp.			
Glyptotendipes spp.	Glyptotendipes spp.			
Gumaga spp.	Gumaga spp.			
Helicopsyche spp.	Helicopsyche spp.			
Hydrobius fuscipes				Not on any status lists
Hydrobius spp.	Hydrobius spp.			
Hydropsyche spp.	Hydropsyche spp.			
Hydropsychidae fam.	Hydropsychidae fam.			
Hydroptila spp.	Hydroptila spp.			
Hydroptilidae fam.	Hydroptilidae fam.			
Ischnura cervula	Pacific Forktail			
Ischnura denticollis	Black-fronted Forktail			
Labrundinia spp.	Labrundinia spp.			
Laccobius spp.	Laccobius spp.			
Lepidostoma spp.	Lepidostoma spp.			
Leptoceridae fam.	Leptoceridae fam.			
Leptohyphidae fam.	Leptohyphidae fam.			
Libellulidae fam.	Libellulidae fam.			
Maruina lanceolata				Not on any status lists
Micrasema spp.	Micrasema spp.			
Micropsectra spp.	Micropsectra spp.			
Microtendipes spp.	Microtendipes spp.			
Nectopsyche spp.	Nectopsyche spp.			
Neoclypeodytes cinctellus				Not on any status lists
Nilotanypus spp.	Nilotanypus spp.			
Nilothauma spp.	Nilothauma spp.			
Notonecta spp.	Notonecta spp.			
Ochrotrichia spp.	Ochrotrichia spp.			
Oxyethira spp.	Oxyethira spp.			
Pantala flavescens	Wandering Glider			
Pantala hymenaea	Spot-winged Glider			

Paracymus spp.	Paracymus spp.			
Paramerina spp.	Paramerina spp.			
Parametriocnemus spp.	Parametriocnemus spp.			
Paraphaenocladius spp.	Paraphaenocladius spp.			
Paratendipes spp.	Paratendipes spp.			
Peltodytes spp.	Peltodytes spp.			
Pentaneura spp.	Pentaneura spp.			
Polycentropus spp.	Polycentropus spp.			
Polypedilum spp.	Polypedilum spp.			
Procladius spp.	Procladius spp.			
Prosimulium spp.	Prosimulium spp.			
Pseudochironomus spp.	Pseudochironomus spp.			
Psychodidae fam.	Psychodidae fam.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Sanfilippodytes spp.	Sanfilippodytes spp.			
Serratella spp.	Serratella spp.			
Simulium donovani				Not on any status lists
Simulium piperi				Not on any status lists
Simulium spp.	Simulium spp.			
Sperchon spp.	Sperchon spp.			
Stictotarsus spp.	Stictotarsus spp.			
Sympetrum corruptum	Variegated Meadowhawk			
Tanypus spp.	Tanypus spp.			
Tanytarsus spp.	Tanytarsus spp.			
Thienemannimyia spp.	Thienemannimyia spp.			
Tinodes spp.	Tinodes spp.			
Tramea calverti				Not on any status lists
Tramea lacerata	Black Saddlebags			
Tramea onusta	Red Saddlebags			
Trichocorixa spp.	Trichocorixa spp.			
Tricorythodes explicatus	A Mayfly			
Tricorythodes spp.	Tricorythodes spp.			
MOLLUSKS				
Ferrissia spp.	Ferrissia spp.			
Gyraulus spp.	Gyraulus spp.			
Helisoma spp.	Helisoma spp.			

Lymnaea spp.	Lymnaea spp.			
Lymnaeidae fam.	Lymnaeidae fam.			
Physa spp.	Physa spp.			
Physella virgata	Protean Physa			CS
Physella virginea	Sunset Physa			CS
Physidae fam.	Physidae fam.			
Pisidium spp.	Pisidium spp.			
Promenetus spp.	Promenetus spp.			
PLANTS				
Lasthenia glabrata coulteri	Coulter's Goldfields		Special	CRPR - 1B.1
Navarretia fossalis	Spreading Navarretia	Threatened	Special	CRPR - 1B.1
Orcuttia californica	California Orcutt Grass	Endangered	Endangered	CRPR - 1B.1
Alnus rhombifolia	White Alder			
Alopecurus saccatus	Pacific Foxtail			
Ammannia coccinea	Scarlet Ammannia			
Ammannia robusta	Grand Redstem			
Anemopsis californica	Yerba Mansa			
Arundo donax	NA			
Azolla filiculoides	NA			
Baccharis salicina				Not on any status lists
Bergia texana	Texas Bergia			
Bolboschoenus glaucus	NA			Not on any status lists
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Bolboschoenus robustus				Not on any status lists
Callitriche marginata	Winged Water-starwort			
Castilleja minor minor	Alkali Indian-paintbrush			
Castilleja minor spiralis	Large-flower Annual Indian-paintbrush			
Crassula aquatica	Water Pygmyweed			
Crassula solieri	NA			Not on any status lists
Crypsis vaginiflora	NA			
Cyperus acuminatus	Short-point Flatsedge			
Cyperus erythrorhizos	Red-root Flatsedge			
Datisca glomerata	Durango Root			

Downingia cuspidata	Toothed Calicoflower			
Echinochloa oryzoides	NA			
Echinodorus berteroi	Upright Burhead			
Eleocharis acicularis acicularis	Least Spikerush			
Eleocharis engelmannii engelmannii	Engelmann's Spikerush			Not on any status lists
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis montevidensis	Sand Spikerush			
Eleocharis parishii	Parish's Spikerush			
Epilobium campestre	NA			Not on any status lists
Euthamia occidentalis	Western Fragrant Goldenrod			
Hydrocotyle umbellata	Many-flower Marsh-pennywort			
Juncus dubius	Mariposa Rush			
Juncus macrophyllus	Longleaf Rush			
Juncus textilis	Basket Rush			
Juncus xiphioides	Iris-leaf Rush			
Lemna gibba	Inflated Duckweed			
Lemna minuta	Least Duckweed			
Limosella aquatica	Northern Mudwort			
Ludwigia peploides peploides	NA			Not on any status lists
Lythrum californicum	California Loosestrife			
Marsilea vestita vestita	NA			Not on any status lists
Mimulus cardinalis	Scarlet Monkeyflower			
Mimulus guttatus	Common Large Monkeyflower			
Mimulus pilosus				Not on any status lists
Myosurus minimus	NA			
Paspalum distichum	Joint Paspalum			
Persicaria lapathifolia				Not on any status lists
Persicaria punctata	NA			Not on any status lists
Phacelia distans	NA			
Pilularia americana	NA			

Plagiobothrys acanthocarpus	Adobe Popcorn-flower			
Plagiobothrys leptocladus	Alkali Popcorn-flower			
Plantago elongata elongata	Slender Plantain			
Platanus racemosa	California Sycamore			
Pluchea sericea	Arrow-weed			
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			
Ranunculus aquatilis aquatilis	White Water Buttercup			
Ranunculus sceleratus	NA			
Rorippa curvipes	Rocky Mountain Yellowcress			
Rorippa sphaerocarpa	Round-fruit Yellowcress			
Rumex conglomeratus	NA			
Rumex salicifolius salicifolius	Willow Dock			
Rumex violascens	Violet Dock			
Salix exigua exigua	Narrowleaf Willow			
Salix gooddingii	Goodding's Willow			
Salix laevigata	Polished Willow			
Salix lasiolepis lasiolepis	Arroyo Willow			
Schoenoplectus americanus	Three-square Bulrush			
Scirpus microcarpus	Small-fruit Bulrush			
Stachys ajugoides	Bugle Hedge-nettle			
Typha domingensis	Southern Cattail			
Typha latifolia	Broadleaf Cattail			
Veronica anagallis-aquatica	NA			
Veronica catenata	NA			Not on any status lists
Veronica peregrina	NA			
Wolffia columbiana	Columbian Watermeal			

Attachment D

July 2019

IDENTIFYING GDEs UNDER SGMA

Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[1] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[2]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.

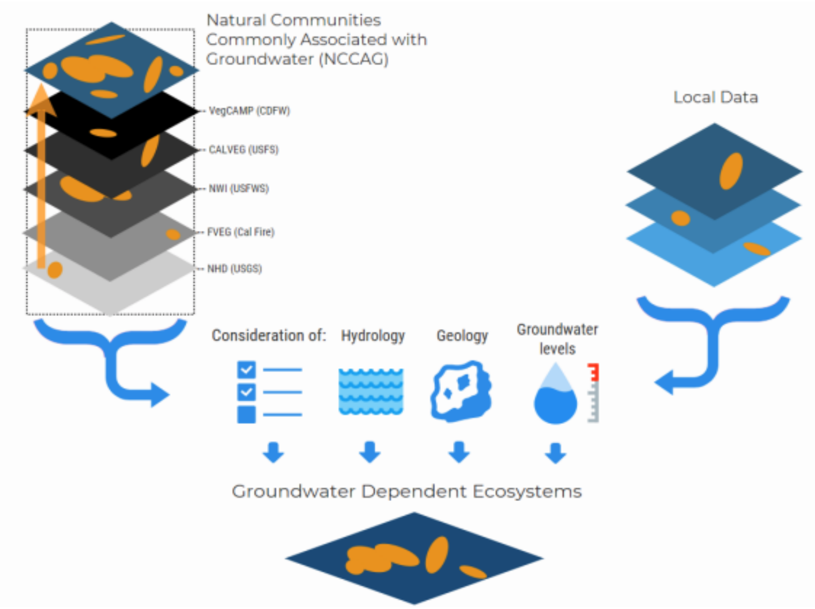


Figure 1. Considerations for GDE identification.
Source: DWR[2]

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[1] NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/

[2] California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[3]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[4] on the Groundwater Resource Hub[5], a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

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[3] For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf

[4] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/

[5] The Groundwater Resource Hub: www.GroundwaterResourceHub.org

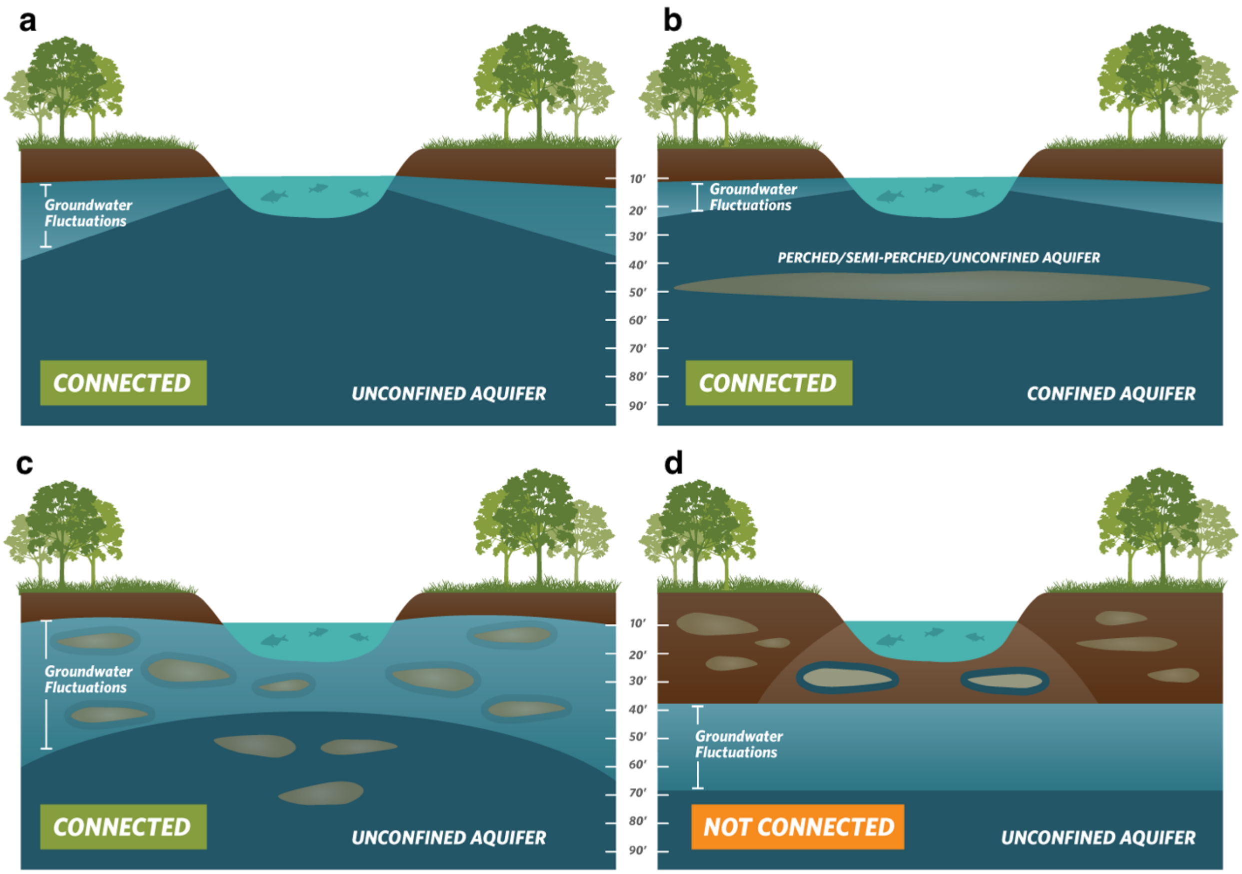

Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. **Bottom: (c)** Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. **(d)** Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets[6] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[7] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[8] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[9]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

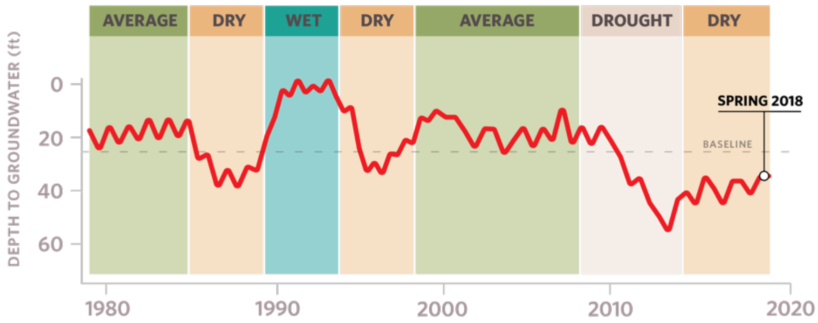

Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

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[6] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[7] Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]

[8] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs[4]).

[9] SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[10], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

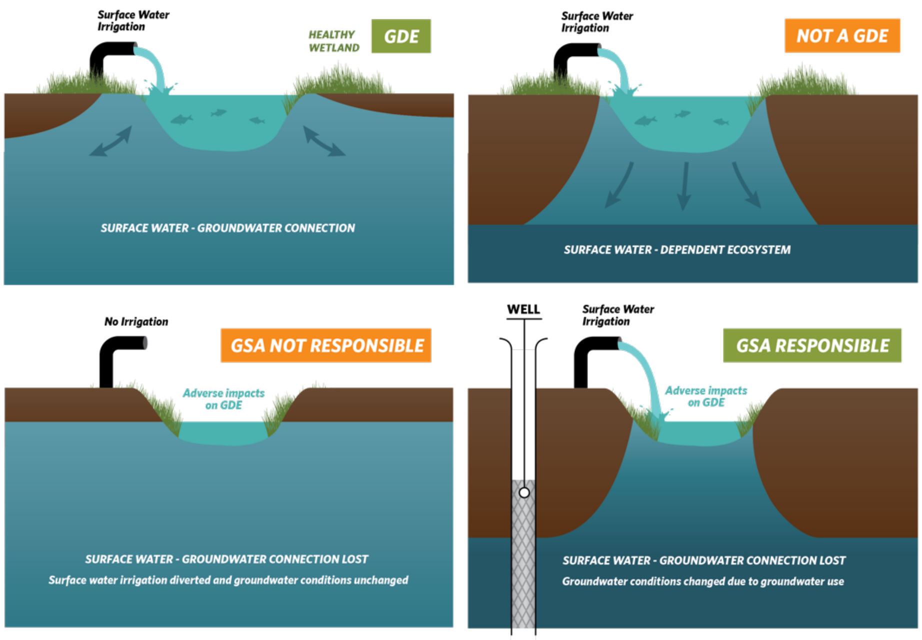

Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **Bottom: (Left)** An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. **(Right)** Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

[10] For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

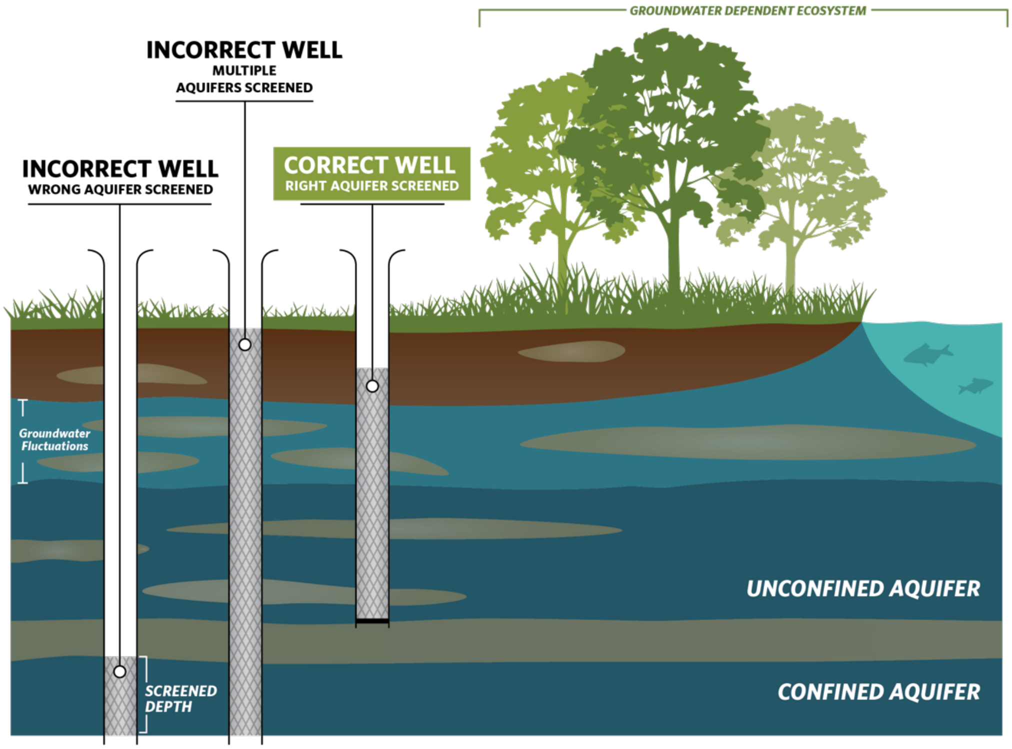

Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate **groundwater elevations** at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[11] to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

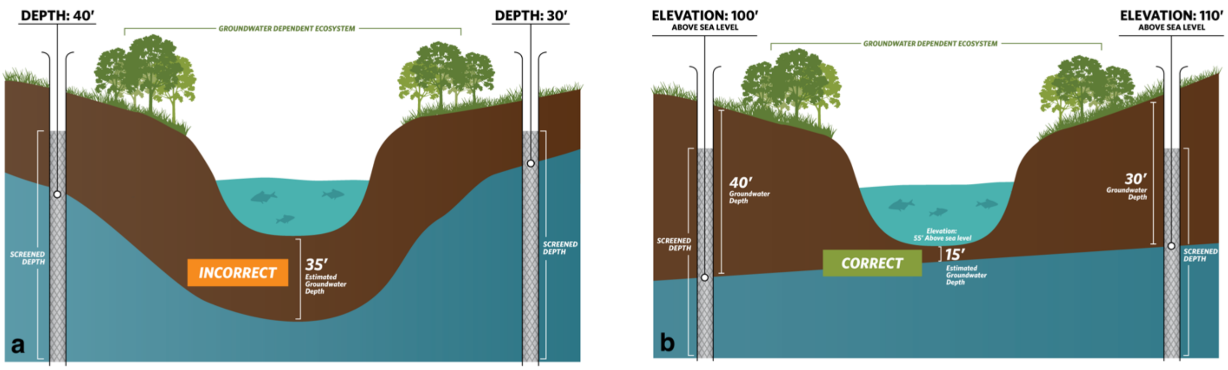

Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

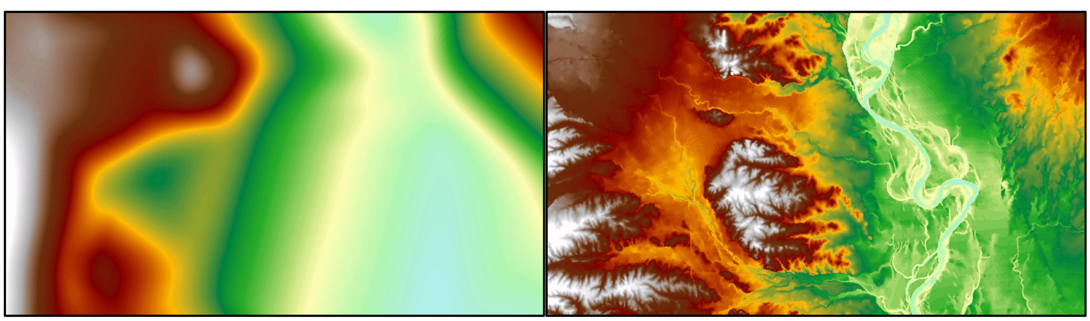

Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

[11] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, **The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network.** Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Commenter	Category	Comment	Response
TNC/Audubon/ LGC/UCS/ CWA/CWF	DAC	Include map and inventory of the location of all domestic wells by location and by depth.	A map (Figure 3-1) has been added to the GSP showing the location of domestic wells and what is known about their screen intervals based on DWR's well completion report map application. All wells in EMWD's current monitoring well network (prior to the implementation of the GSP) are shown on Figure 2-6. As part of the GSP implementation, a project will be implemented by EMWD as the GSA to identify all wells in the GSA Plan Area and wells that produce greater than 2 AFY will be added to EMWD's monitoring well network. This approach is consistent with SGMA legislation. EMWD has also added a project (see Section 4.7 - Project #4) to identify the location and status of the domestic wells listed in the DWR database. If there are individual well users that require connection to EMWD's, or their respective water purveyor's, system because their well does not meet drinking water standards or because it is impacted by groundwater level declines, the option will be available to them to connect to the potable system . This language has been added to the GSP (see Section 4.7.2).
TNC/Audubon/ LGC/UCS/ CWA/CWF	DAC	Identify the sources of drinking water for DAC members, including an estimate of how many people rely on groundwater (e.g., domestic wells, state small water systems, and public water systems). The GSP states that "Disadvantaged Communities (DACs) within the Plan Area receive water from cities, mutual water companies, or EMWD". However the GSP does not currently provide clear information on how and to what extent DAC members rely on groundwater.	Language has been added to indicate that groundwater in the vicinity of the DACs identified in the GSP may require treatment before consumption. Therefore DACs are not known to rely on groundwater for drinking water in the Plan Area. EMWD conducts regular outreach to DAC communities and will conduct an additional investigation to determine whether any domestic wells listed in the DWR database are still in use.
TNC/Audubon/ LGC/UCS/ CWA/CWF	ISW	Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations f rom a digital elevation model (DEM) to estimate depth to groundwater contours across the landscape. This will provide accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.	Depth-to-groundwater contour maps were generated for the spring and fall of 2018 (see Figures 2-49 and 2-50).
TNC/Audubon/ LGC/UCS/ CWA/CWF	ISW	Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate, when mapping ISWs.	Seasonal data over multiple water years were reviewed and used to prepare the GSP. All water level data are provided in the appendices, the figures in Chapter 2 include multiple hydrographs over multiple years, and streamflow data from 4 gauges is provided over multiple years including both above and below average precipitation periods.
TNC/Audubon/ LGC/UCS/ CWA/CWF	ISW	Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.	Specific measures to reconcile data gaps related to ISWs are not required in the Plan Area unless groundwater production may impact potential or known GDEs. There are no potential or identified GDEs in the Plan Area that are associated with ISWs along surface water features.
TNC/Audubon/ LGC/UCS/ CWA/CWF	GDEs	Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step i s contouring groundwater elevations, and then subtracting this layer from land surface elevations f rom a digital elevation model (DEM) t o estimate depth to groundwater contours across the landscape.	Depth-to-groundwater contour maps were generated for the spring and fall of 2018 (see Figures 2-49 and 2-50).
TNC/Audubon/ LGC/UCS/ CWA/CWF	GDEs	If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network.	Polygons with insufficient data to describe groundwater conditions were included as potential GDEs in the GSP.
TNC/Audubon/ LGC/UCS/ CWA/CWF	GDEs	In addition to describing the vegetation and wetland communities from the NC dataset in the GSP area (as provided in Tables 1-4 in Appendix J), please also provide an inventory, map, or description of fauna (e.g., birds, fish, amphibian) species in the basin and note any threatened or endangered species (see Appendix C in this letter for a list of freshwater species located in the San Jacinto groundwater basin).	A table was added indicating the fauna in the Plan Area. Please note that the east side of the San Jacinto groundwater basin is managed by the Hemet-San Jacinto Watermaster and the sustainable management criteria described in the GSP apply only to the Plan Area, not the entire San Jacinto groundwater basin.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Native vegetation and managed wetlands	Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector including native vegetation and managed wetlands.	A discussion was added to Section 2.5.8.2
TNC/Audubon/ LGC/UCS/ CWA/CWF	Engaging Stakeholders	Include a more detailed and robust POEP that details how DAC community members and environmental stakeholders will be targeted and engaged during the remainder of the GSP development process and throughout the GSP implementation phase.	The POEP has been updated.

Commenter	Category	Comment	Response
TNC/Audubon/ LGC/UCS/ CWA/CWF	Engaging Stakeholders	Conduct outreach at frequented locations such as farmers markets, schools across the plan area providing translation services and technical assistance where needed.	Eastern Municipal Water District's (EMWD) Public and Governmental Affairs staff has engaged with numerous community groups throughout its 555-square mile service area on issues related to groundwater, groundwater basin management and related projects and initiatives. EMWD staff has met with councils from each of the seven cities it serves, staff from the offices of Riverside County supervisors, spoken to Municipal Advisory Councils and presented at local chamber of commerce, rotary, and community groups. Presentations have been conducted in English and Spanish depending on the needs of the audience and materials have been translated to fit the audience need as well. EMWD's Public Affairs staff will continue to work to participate with the community and stakeholders throughout the region.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Chronic lowering of groundwater levels	Calculate and present on maps the anticipated change in water levels for measurable objectives and minimum thresholds relative to current groundwater conditions. These maps should clearly identify the locations of beneficial users, including DACs, populations dependent on domestic wells for drinking water, and small community water systems.	This information is in the GSP in Figures 3-5 through 3-11. An map has been added (Figure 3-1) which summarizes the information in the existing figures and tables in Chapter 3.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Chronic lowering of groundwater levels	Identify the location and number of domestic wells that would be anticipated to be impacted at the measurable objectives and minimum thresholds, utilizing well construction information available in DWR's Well Completion Report Map Application. Include an estimate of the population anticipated to be affected under these conditions. In order to mitigate against the undesirable result of community members losing access to drinking water, GSAs should identify a program to mitigate such impacts to these beneficial users.	The current status of the domestic wells in the Plan Area is not known, as the locations of the domestic wells listed in DWR's database are within the service area of EMWD or other local water purveyors and are in areas where the groundwater may require treatment prior to consumption. A project has been added to the GSP (see Section 4.7) to determine the status of these wells and identify any active domestic wells that currently have potable water and may be impacted by water level declines in the Plan Area. Stakeholders with active potable domestic wells that are impacted by water level declines will have the option to connect to their local water purveyor.
TNC/Audubon/ LGC/UCS/ CWA/CWF	WQ	The plan only sets Minimum Thresholds (MTs) and Measurable Objectives (MOs) for total dissolved solutes (TDS). The GSA should set MTs and MOs for nitrates and ensure they align with drinking water standards .	The concentration of nitrate in the groundwater in the Lakeview GMZ exceeded drinking water standards in several wells prior to the implementation of SGMA in 2014. EMWD has historically, and is currently managing this area to minimize impacts to agricultural operations, but is not managing it to clean up the groundwater to drinking water standards.
TNC/Audubon/ LGC/UCS/ CWA/CWF	WQ	We recommend that the GSA provide distinct maps for VOC, nitrate and perchlorate contamination plumes as required in SGMA regulations.	Maps of "the location of known groundwater contamination sites and plumes" are provided in Figures 2-44 and 2-45, as required in SGMA regulations. There is no requirement to provide maps of separate plumes. Furthermore, the maps provided include the current understanding of the plumes. If additional information becomes available and visualization of the plumes would be improved by generating separate maps, that will be evaluated in the future.
TNC/Audubon/ LGC/UCS/ CWA/CWF	GDEs	When defining undesirable results for chronic lowering of groundwater levels, water quality, and depletions of interconnected surface waters, please provide more specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results occur when 'significant and unreasonable' effects on beneficial users are caused by groundwater. Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the basin. Without defining undesirable results, the minimum thresholds cannot be determined. Potential effects on all beneficial users of groundwater in the basin need to be taken into consideration when defining undesirable results, establishing minimum thresholds , and the impacts to beneficial users of selected minimum thresholds must be analyzed.	The undesirable results were defined based on impacts to all beneficial uses and users of groundwater in the Plan Area. Specific undesirable results were not defined for any individual subset of beneficial uses or users.
TNC/Audubon/ LGC/UCS/ CWA/CWF	ISWs	For the interconnected surface water SMC, the undesirable results should include a description of potential impacts on instream habitats within ISWs when defining minimum thresholds in the basin. The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts to environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP (See Appendix B for a list of freshwater species in your basin). These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law.	The undesirable results were defined based on impacts to all beneficial uses and users of groundwater in the Plan Area. Specific undesirable results were not defined for any individual subset of beneficial uses or users. Furthermore, there are no GDEs identified adjacent to or along any stream channel in the Plan Area that would be impacted by groundwater production.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Climate Change	Integrate climate extreme wet and dry scenarios into projected water budget for development of sust management criteria.	A discussion of the extreme scenarios has been added to sections 2.2.3 and 2.5.8.1
TNC/Audubon/ LGC/UCS/ CWA/CWF	Climate Change	Document how climate change was incorporated into surface water flow inputs.	Incorporation of climate change in surface water flows is discussed in Sections 2.5.6.3.3 and 2.5.6.3.4
TNC/Audubon/ LGC/UCS/ CWA/CWF	Climate Change	Sustainable yield should be based on the projected water budget with climate change incorporated.	The sustainable yield of the Plan Area is based on avoiding undesirable results. The minimum thresholds are groundwater elevations and groundwater quality concentrations that indicate when the Plan Area would experience undesirable results, and are independent of climate change.

Commenter	Category	Comment	Response
TNC/Audubon/ LGC/UCS/ CWA/CWF	Climate Change	Incorporate climate change scenarios into projects and management actions.	Climate change has been incorporated into the future understanding of the Plan Area, however projects and management actions are triggered by groundwater elevations or groundwater quality impacts to the Plan Area, independent of the future climate. The Plan Area will be managed based on the sustainable management criteria set forth in the GSP.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Data Gaps	Provide maps that overlay monitoring well locations and locations of DACs and GDEs	Figure 3-1 has been added showing the location of the representative monitoring points, the location of domestic wells identified in DWR's database, and the location of DACs in the Plan Area. The figures in Appendix J show the location of potential GDEs and the closest monitoring wells at a scale that the potential GDEs can be seen.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Data Gaps	Reconcile data gaps by evaluating how data gathered will be used to ID and map GDEs and ISWs, and identify DACs and shallow domestic well users vulnerable to undesirable results.	A project has been added to identify potential active shallow domestic wells (see Section 4.7). As projects are developed adjacent to potential GDEs the project proponents will have to fill in data gaps and determine if the project may impact the GDEs.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Data Gaps	Increase the number of representative monitoring points, prioritize proximity to DACs and drinking water users.	The representative monitoring points prioritize understanding of groundwater conditions throughout the Plan Area, and were selected based on their ability to accurately represent conditions in the Plan Area. The density of these points equals the monitoring well density for *an entire monitoring network* in DWR's BMP guidance document on monitoring networks. These points are a subset of a broader monitoring network, which will continue to be used moving forward (see Section 3.5). If active domestic well users are identified, additional representative monitoring points may be recommended in future updates to the GSP. The current representative monitoring points are adequate to assess groundwater conditions in the Plan Area.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Data Gaps	Determine what ecological monitoring can be used to assess potential for significant and unreasonable impacts to GDEs or ISWs due to GW conditions.	Ecological monitoring for GDEs or ISWs is not required at this time. In the event that it becomes required because projects are proposed in the vicinity of an identified GDE, individual project proponents will develop an appropriate monitoring protocol.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Addressing Beneficial Users in Projects and Management Actions	For GDEs and ISWs, recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For guidance on how to integrate multi-benefit recharge projects into your GSP refer to the "Multi-Benefit Recharge Project Methodology Guidance Document".	Noted. There is no need for such projects at the current time. The GSA will continue to evaluate need for projects like these over the GSP implementation period.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Addressing Beneficial Users in Projects and Management Actions	For all beneficial users, provide public notice and engagement before consideration and implementation of the three management actions and two projects identified.	Noted. EMWD has historically engaged with and currently engages with stakeholders, including DACs, that could be impacted by projects or management actions undertaken. EMWD will continue to do so as the GSA in the future under this GSP.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Addressing Beneficial Users in Projects and Management Actions	For DACs, monitor the impacts of selected management actions and projects on communities and drinking water users.	Impacts of projects and management actions will be monitored as these projects and management actions are implemented and if domestic well users are identified. An additional project has been added to the GSP to assess the status and location of individual domestic well users.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Addressing Beneficial Users in Projects and Management Actions	For DACs and domestic well owners, implement a drinking water well mitigation program to avoid the significant and unreasonable loss of drinking water. This could include a combination of replacing impacted wells with new, deeper wells and/or connecting domestic users to a public water system.	Language has been added to the GSP to say that impacted DAC / domestic well owners can connect to a public water system.
TNC/Audubon/ LGC/UCS/ CWA/CWF	Addressing Beneficial Users in Projects and Management Actions	For DACs, a discussion of whether potential impacts to water quality from projects and management actions could occur.	Projects and management actions in the GSP are designed to improve groundwater conditions in the Plan Area, this includes groundwater quality (see Chapter 4).
TNC/Audubon/ LGC/UCS/ CWA/CWF	Addressing Beneficial Users in Projects and Management Actions	Develop management actions to prevent future undesirable results that incorporate climate and water delivery uncertainties and address water demand.	Management actions that prevent future undesirable results and incorporate climate and water delivery uncertainties have already been developed for the GSP. They are: (1) Adjusting groundwater production to meet WL and/ or WQ objectives; (2) Imposing a replenishment or imported water purchase/ pumping offset fee; (3) Developing a groundwater allocation; (4) Assessing the feasibility of recycled water delivery in-lieu of the use of groundwater.

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From: Michele Staples <MStaples@XXXXXXXXXXXX.XXX>
Sent: Wednesday, July 14, 2021 11:50 AM
To: Javier, Alfred
Cc: Gray, Rachel; Jill Weinberger
Subject: RE: San Jacinto Groundwater Basin: Groundwater Sustainability Plan Public Draft Document

Thank you Al. Very helpful

From: Javier, Alfred [mailto:javiera@XXXX.XXX]
Sent: Wednesday, July 14, 2021 11:24 AM
To: Michele Staples
Cc: Gray, Rachel; jweinberger@XXXXX.XXX
Subject: FW: San Jacinto Groundwater Basin: Groundwater Sustainability Plan Public Draft Document

Hi Michele,

To answer your question about lack of assimilative capacity and use of recycled water in the various Groundwater Management Zones (GMZs), EMWD is allowed to provide the recycled water through the Master Permit, Order No. R8-2008-0008. There may not be assimilative capacity for each GMZs but thru the Master Permit, EMWD has worked in mitigation. Where the GMZ's Water Quality (WQ) Objective for TDS is above the recycled water TDS, there is no impact since it would be a better quality than the WQ Objective. If the recycled water TDS is higher than the GMZ's WQ Objective, mitigation is required such as extraction and removal of the salt via brine line (i.e., desalter wells, desalination, and brine discharge). Typically, in this situation, the recycled water TDS is lower than the ambient water quality and, therefore, would reduce the TDS. As for Nitrate, the Regional Board looks at the use of the recycled water where irrigation for crop or landscape and considers this as 100% uptake of the Nitrate applied. The exception is when the recycled water is percolated into the ground from the ponds. Again, the nitrate would need to be mitigated thru same process as TDS. EMWD reports the balance of extraction TDS/Nitrate versus the applied on a monthly, quarterly, and annual basis which address the usage of recycled water.

Hopefully, this answer your question. If you would like to discuss, please contact me.

Thank you.

Alfred "Al" Javier
Director of Environmental and Regulatory Compliance
Eastern Municipal Water District
P.O. Box 8300
2270 Trumble Road
Perris, CA 92572-8300
Office (951) 928-3777 ext. 6327
Email: javiera@XXXX.XXX

From: Gray, Rachel <grayr@XXXX.XXX>
Sent: Tuesday, July 13, 2021 10:44 AM
To: Javier, Alfred <javiera@XXXX.XXX>
Cc: Jill Weinberger (jweinberger@XXXXX.XXX)
Subject: FW: San Jacinto Groundwater Basin: Groundwater Sustainability Plan Public Draft Document

Hi Al,

Michele Staples had a question on the DRAFT GSP document regarding using recycled water in lieu of groundwater as a proposed project. Please take a look at her question below and a response from you would be greatly appreciated.

Thanks,

Rachel M. Gray
Water Resources Planning Manager
Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300
Phone: 951-928-3777 ext. 4514
Email: grayr@XXXX.XXX

From: Michele Staples <MStaples@XXXXXXXXXXXX.XXX>
Sent: Friday, July 2, 2021 10:14 AM
To: Gray, Rachel <grayr@XXXX.XXX>
Subject: RE: San Jacinto Groundwater Basin: Groundwater Sustainability Plan Public Draft Document

Hi Rachel. Thank you for returning my call on your day off. After we hung up, I figured out the answer to my question about one of the figures in the GSP. My other question is related to the lack of assimilative capacity. What are the ramifications for irrigators using recycled water in the Plan Area?

Thank you. Happy 4th!

Michele A. Staples
Shareholder
mstaples@XXXXXXXXXXXX.XXX
D: 949.851.7409
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****I am currently working remotely, please use Cell Phone****
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From: Gray, Rachel [mailto:grayr@XXXX.XXX]
Sent: Monday, June 21, 2021 5:50 AM
To: Ajobiewe, Stephen; Ares, Jennifer; Armstrong, Margie; Chatha, Pakiza; Gandara, Mallory; Hockett, Katie; Javier, Alfred; Lehto, Eric; Mains, Steven; Mortazavi, Behrooz; Robbins, Cinthia; Ross, Timothy; Samsam, Kevan; Shaw, Ryan; Waters, Douglas; Michael Lloyd, P.E.; Mark Norton; Michele Staples; Ellinghouse, Leroy@DWR; Kristian Alfelor; Eva Plajzer

Cc: Powell, Brian; Jill Weinberger (jweinberger@dudek.com)
Subject: San Jacinto Groundwater Basin: Groundwater Sustainability Plan Public Draft Document

[CAUTION]: External Email. Use caution when opening links or attachments.

Good Morning Stakeholder Advisory Group Members,

This email is intended to serve as a follow-up to the notification sent on Friday, April 16, 2021 after the San Jacinto Groundwater Basin Public Draft Groundwater Sustainability Plan (GSP) Document was made available for public review. I wanted to remind you that the Public Draft GSP is currently available for review and can be downloaded from the EMWD SGMA webpage under Project Documents.

Please visit the EMWD SGMA webpage: https://www.emwd.org/post/sustainable-groundwater-management-act and navigate to Project Documents, where you will find the individual chapters and appendices.

The public review is a 90-day period:

- Start of Public Review Period: Friday, April 16, 2021
- Close of Public Review Period: Thursday, July 15, 2021

You can send your comments via email or attachments to grayr@XXXX.XXX or mail in comments to the address below. Please don't hesitate to reach out to us with any questions.

EMWD Mailing Address:
2270 Trumble Road,
Perris, CA 92572
Attn: Rachel Gray

Thanks and have a great day,

Rachel M. Gray
Water Resources Planning Manager
Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300
Phone: 951-928-3777 ext. 4514
Email: grayr@XXXX.XXX

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APPENDIX F

Outreach and Engagement Plan

PUBLIC OUTREACH AND ENGAGEMENT PLAN

Prepared for:

San Jacinto Groundwater Basin
West San Jacinto Groundwater Sustainability Agency

EMWD EASTERN MUNICIPAL WATER DISTRICT

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024

Originally Prepared: August 2019
Updated: August 2021

TABLE OF CONTENTS

GLOSSARY OF TERMS/ABBREVIATIONS

Acronym/Abbreviation	Definition
DWR	California Department of Water Resources
EMWD	Eastern Municipal Water District
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
LHMWD	Lake Hemet Municipal Water District
SAG	Stakeholder Advisory Group
SGMA	Sustainable Groundwater Management Act
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
Term	**Definition**
Engagement	Efforts made to understand and involve stakeholders and their concerns in the activities and decision-making of the West San Jacinto GSA
Stakeholder	An individual with interest in the West San Jacinto GSP

1 BACKGROUND OF THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

The Sustainable Groundwater Management Act (SGMA), signed into law by Governor Jerry Brown on September 16, 2014, created a new framework for groundwater management in California. The framework includes a structure and schedule to achieve sustainable groundwater management within 20 years after the adoption and implementation of a Groundwater Sustainability Plan (GSP).

The California Department of Water Resources (DWR) has historically managed the state's central repository for groundwater data. Under SGMA, DWR provides guidance, financial assistance, and technical support for compliance with state requirements. The State Water Resources Control Board (SWRCB) provides the regulatory backstop under SGMA, taking over basin management and assessing fees, if local groundwater management is not successful in complying with the requirements of SGMA.

SGMA established a new structure for local groundwater management through Groundwater Sustainable Agencies (GSAs). DWR designated priorities to groundwater basins, requiring the formation of GSAs for all medium and high priority basins by July 1, 2017. A GSA for the West San Jacinto Groundwater Basin, which oversees the non-adjudicated portion of the San Jacinto Groundwater Basin, was formed in accordance with SGMA on April 24, 2017. The GSAs for high and medium priority basins must then develop a GSP that outlines how sustainable groundwater management will be achieved within 20 years of implementing the GSP. Sustainable groundwater management is defined by SGMA as *the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results*. This avoidance of undesirable results is measured through six sustainability indicators:

1. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon,
2. Significant and unreasonable reduction of groundwater storage,
3. Significant and unreasonable seawater intrusion,
4. Significant and unreasonable degradation of water quality,
5. Significant and unreasonable land subsidence, and
6. Depletion of interconnected surface water and groundwater that has significant and unreasonable adverse impacts on beneficial uses and users of the surface water.

The GSP is a tool used to help the GSA sustainably manage the basin. The criteria for sustainable management, including determining what is significant and unreasonable within the parameters of SGMA, must be assessed locally, with input from stakeholders, before the GSP can be adopted and implemented.

1.1 Sustainable Groundwater Management Act Requirements for Stakeholder Engagement

Stakeholder engagement is an important component of any successful long-term planning effort. Engaging members of the public in groundwater sustainability planning will improve public understanding of the technical and political considerations the GSA factors into their decision-making process. Participation by the public will also improve the GSA's understanding of the potential impacts of their decisions.

SGMA recognized the importance of stakeholder engagement and laid out specific requirements for stakeholder engagement within each of the four phases of SGMA:

Phase 1: GSA Formation and Coordination
The following Phase 1 requirements were completed by the West San Jacinto GSA in 2017 and 2018:

- Establish and maintain a list of interested parties.
- Provide public notice of the GSA formation.
- Conduct a GSA formation public hearing.
- Notify DWR of the GSA formation.
- Provide a written statement to DWR as well as cities and counties within the GSA boundary describing how interested parties may participate in the GSP development.
- Develop GSA website for interested parties.

Phase 2: GSP Preparation and Submission
The following Phase 2 requirements will be completed by the West San Jacinto GSA by January 31, 2022:

- Submit GSP preparation initial notification (completed).
- Prepare a GSP that considers beneficial uses and users of groundwater when describing undesirable results, minimum thresholds, projects, and management actions.
- The GSP must include a communication section that includes the following:
  - An explanation of the Agency's decision-making process.
  - Identification of opportunities for public engagement and a discussion of how public input and responses will be used.
  - A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.
  - The method the Agency will follow to inform the public about progress implementing the Plan, including the status of projects and actions.
- The GSA must provide public notice and hold a public meeting before adopting or amending a GSP.

Phase 3: GSP Review and Evaluation

The following Phase 3 requirements will be completed by DWR:

- After the GSA adopts the GSP and submits it to DWR, the GSP will be available on the DWR website for a 60-day comment period for any person to provide comments to DWR before DWR completes the evaluation and assessment of the GSP.

Phase 4: Implementation and Reporting

The following Phase 4 requirements will be completed by the West San Jacinto GSA through 2042:

- SGMA requires assessments and re-evaluation of the GSP at least every five years. The GSA must provide public notice and hold public meetings prior to amending the GSP.
- Public notice is also required before the GSA imposes or increases fees.

There are also general requirements that apply to all four phases of SGMA implementation. Each GSA must encourage active involvement of diverse social, cultural, and economic elements of the population within the groundwater basins. The GSA must also allow for voluntary participation by Native American Tribes and the federal government. The GSA may appoint and consult with an advisory committee and must consider the interests of all beneficial uses and users of groundwater within the basin.

2 SAN JACINTO GROUNDWATER BASIN

The San Jacinto Groundwater Basin (Basin), located in western Riverside County within the San Jacinto River Watershed, is the source of groundwater production for Eastern Municipal Water District (EMWD), Lake Hemet Municipal Water District (LHMWD), City of Hemet, City of San Jacinto, City of Perris Water, Nuevo Water Company, Box Springs Mutual Water Company, March Air Reserve Base, and private water purveyors. The Basin has two primary management areas, the Hemet-San Jacinto Management Area and the West San Jacinto GSA Area.

Hemet-San Jacinto Watermaster Management Area

The eastern portion of the Basin is known as the Hemet-San Jacinto Management Area. It encompasses approximately 90 square miles including the Cities of San Jacinto and Hemet, as well as the unincorporated areas of Winchester, Valle Vista, and Cactus Valley. Water purveyors of the area include EMWD, LHMWD, City of Hemet, City of San Jacinto, and the Soboba Band of Luiseño Indians. In April 2013, a Stipulated Judgment, Case Number RIC 1207274, was entered with the Superior Court of the State of California for the County of Riverside adopting the Management Plan and creating the Hemet-San Jacinto Watermaster (Watermaster). The Stipulated Judgment requires the preparation of an Annual Report by the Watermaster to document activities within the Hemet-San Jacinto Watermaster Management Area in a given year. The Watermaster has been submitting the Hemet-San Jacinto Annual Reports to DWR since

2015 to comply with SGMA requirements for adjudicated basins. The Watermaster Documents can be viewed online (https://www.dropbox.com/sh/ok0kxmphpt4ymtv/AADU8OEySlgZLGIvNANXh3FBa?oref=e&n=176495568).

West San Jacinto Groundwater Sustainability Agency Area

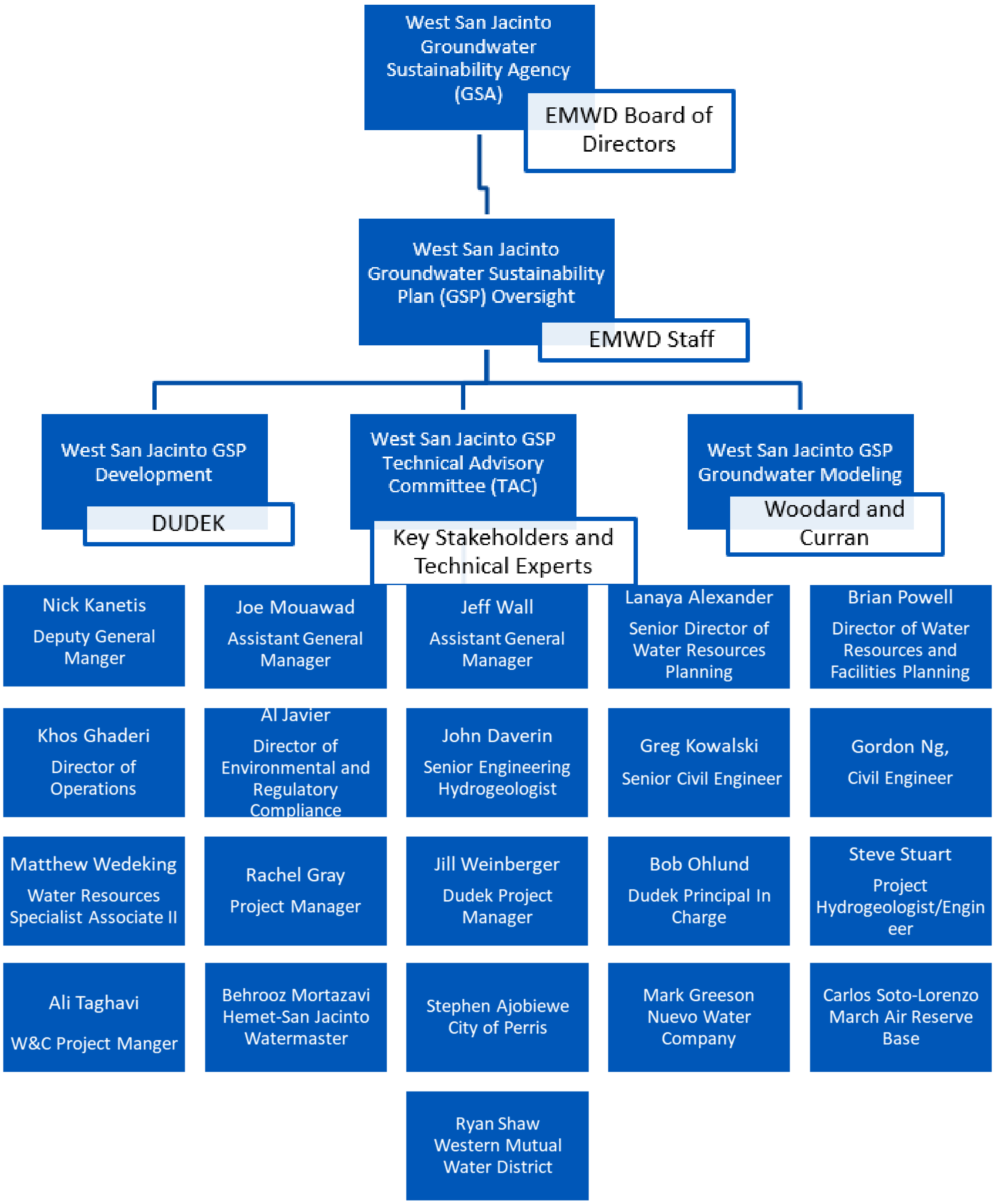
The western portion of the Basin, formerly known as the West San Jacinto Groundwater Management Area, has been actively managed by EMWD as part of a voluntary effort in accordance with Assembly Bill 3030 passed in 1992. EMWD is the GSA for this portion of the Basin, which is referred to as the West San Jacinto GSA Area. As the GSA, EMWD is responsible for management of the West San Jacinto GSA Area. The West San Jacinto GSA Area covers approximately 256 square miles including the cities of Moreno Valley, Menifee, and Perris as well as unincorporated areas of Lakeview, Nuevo, and Winchester. The West San Jacinto Groundwater Basin GSA Area was designated a high priority basin (but not in a state of critical overdraft) by DWR, requiring GSP adoption by 2022 and implementation by 2042.

3 WEST SAN JACINTO GSA

The EMWD Board of Directors became the exclusive GSA (West San Jacinto GSA) for the West San Jacinto GSA Area on April 24, 2017. Notice of the GSA formation was published in the Press Enterprise on October 30, and November 20, 2016. A GSA formation public hearing was conducted on December 7, 2016 and notification of GSA formation was provided to DWR on January 24, 2017.

3.1 GSA Decision Making Process

The West San Jacinto GSA is governed by the EMWD Board of directors, a five member elected board. EMWD staff administers the GSA and will oversee the development of the West San Jacinto GSP. A Technical Advisory Committee (TAC) was established to advise the West San Jacinto GSA on matters related to the West San Jacinto GSP development. The TAC will evaluate the sustainability indicators and recommend management criteria to the GSA. Members of the TAC include representatives from each of the groundwater purveyors in the West San Jacinto GSA Area as well as technical experts. Monthly TAC meetings will be held throughout the development of the GSP to discuss the elements of the GSP. This format facilitates participation from the groundwater purveyors during development of the GSP.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DUDEK
West San Jacinto GSP Technical Advisory Committee (TAC)
Key Stakeholders and Technical Experts
West San Jacinto GSP Groundwater Modeling
Woodard and Curran
Nick Kanetis
Deputy General Manger
Joe Mouawad
Assistant General Manager
Jeff Wall
Assistant General Manager
Lanaya Alexander
Senior Director of Water Resources Planning
Brian Powell
Director of Water Resources and Facilities Planning
Khos Ghaderi
Director of Operations
Al Javier
Director of Environmental and Regulatory Compliance
John Daverin
Senior Engineering Hydrogeologist
Greg Kowalski
Senior Civil Engineer
Gordon Ng,
Civil Engineer
Matthew Wedeking
Water Resources Specialist Associate II
Rachel Gray
Project Manager
Jill Weinberger
Dudek Project Manager
Bob Ohlund
Dudek Principal In Charge
Steve Stuart
Project Hydrogeologist/Engineer
Ali Taghavi
W&C Project Manger
Behrooz Mortazavi
Hemet-San Jacinto Watermaster
Stephen Ajobiewe
City of Perris
Mark Greeson
Nuevo Water Company
Carlos Soto-Lorenzo
March Air Reserve Base
Ryan Shaw
Western Mutual Water District

4 GSP FOR THE SAN JACINTO GROUNDWATER BASIN

The West San Jacinto GSA developed a GSP for the non-adjudicated portion of the San Jacinto Groundwater Basin. The GSP defines a course of action to demonstrate sustainable groundwater management within 20 years of plan adoption and implementation. The West San Jacinto GSP has identified local undesirable results, management actions to minimize undesirable results. A SGMA-compliant groundwater monitoring program has been developed and implemented to track groundwater conditions in the West San Jacinto GSA Area. The West San Jacinto GSP will be re-evaluated and refined, as needed, and submitted to DWR at a minimum of every five years in accordance with SGMA.

5 PURPOSE OF THIS DOCUMENT

This Public Outreach and Engagement Plan (Plan) has been developed as a communication tool to help stakeholders understand the importance of participation in groundwater sustainability planning and to lay the framework of how stakeholders can actively engage in the West San Jacinto GSP development and implementation effort. In 2018, DWR released a guidance document for GSP Stakeholder Communication and Engagement that details best practices including the development of Communication and Engagement Plans to increase transparency in the GSP development process. This Plan has been prepared based on this guidance, local stakeholder knowledge, and the direction of the West San Jacinto GSA.

The West San Jacinto GSA's primary goals for Outreach and Engagement during the GSP development and implementation process include:

1. Maintaining transparency throughout the GSP development process,
2. Developing a common understanding among stakeholders of what SGMA is, EMWD's role, the effect on EMWD customers and
3. Exceeding the state requirements for outreach and engagement.

This Plan is intended to be a guiding framework that will be updated as needed to maintain transparency throughout the GSP development and implementation process.

6 OPPORTUNITIES FOR PUBLIC INVOLVEMENT AND ENGAGEMENT

The West San Jacinto GSA encourages members of the public to participate in the GSP development and implementation process through attending public meetings, providing comments on the draft GSP, and communicating directly with EMWD staff and Board members. Members of the public and interested parties can subscribe to receive updates via email through the SGMA page on EMWD's website to stay informed regarding news, updates, and meeting announcements.

Additionally, Eastern Municipal Water District's (EMWD) Public and Governmental Affairs staff, who act as the outreach contacts for the West San Jacinto GSA, have engaged and will continue to engage with numerous community groups throughout the GSP Plan Area, the San Jacinto Groundwater Basin, and EMWD's 555-square mile service area. The Public Affairs staff regularly engage on issues related to groundwater, groundwater basin management and related projects and initiatives. EMWD Public Affairs staff has met with councils from each of the seven cities it serves, staff from the offices of Riverside County supervisors, spoken to Municipal Advisory Councils and presented at local chamber of commerce, rotary, and community groups (Table 1).

Table 1. Public and Governmental Affairs Outreach Opportunities

Hemet	Frequency	Minimum Attendance
Chamber of Commerce Events: (Hemet-San Jacinto Chamber)		
• State of the City for Hemet	1/Year	1/Year
• Chamber Mixers	12/Year	4/Year
• Annual SCORE Mixer	1/Year	1/Year
• First Friday Morning Mixer w/speaker	12/Year	8/Year
• Chamber Awards Gala	1/Year	1/Year
• Government Action Committee	6/Year	Attend as needed
• Legislator Updates	Quarterly	Attend as needed
• Candidate Forum	1/Year	1/Year
City Meetings:		
City Council Meetings	24/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
Western Science Center: Science under the Stars	1/Year	Attend as needed
Moreno Valley	**Frequency**	**Minimum Attendance**
Chamber of Commerce Events:		
• State of the City	1/Year	1/Year
• Chamber Mixers	12/Year	4/Year
• Wake Up Moreno Valley w/ speaker	12/Year	6/Year
• Rally 'Round the Flag	1/Year	1/Year
• Mega Mixer	1/Year	1/Year
• Mash Bash	1/Year	1/Year
• Joint Chamber Mixer	1/Year	1/Year
• Installation & Awards Event	1/Year	1/Year

Public Outreach and Engagement Plan

Table 1. Public and Governmental Affairs Outreach Opportunities		
• Government Affairs Committee	12/Year	Attend as needed
• Legislator Updates	Quarterly	Attend as needed
• Candidate Forums	1/Year	1/Year
• Hispanic / Black Chamber Mixers	12/Year each	H- 4/Year - B- 2/Year
City Meetings:		
City Council Meetings	24/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
City of Moreno Valley Quarterly Utility Meeting	4/Year	4/Year
Director Advisory Committee Meeting	3-4/Year	3-4/Year
San Jacinto	**Frequency**	**Minimum Attendance**
Chamber of Commerce Events:		
• State of the City	1/Year	1/Year
City Meetings:		
City Council Meetings	12/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
Winchester and Lakeview	**Frequency**	**Minimum Attendance**
Winchester MAC	12/Year	8/Year
Lakeview Nuevo MAC	4/Year	2/Year
Menifee	**Frequency**	**Minimum Attendance**
Chamber of Commerce Events:		
• State of the City	1/Year	1/Year
• Chamber Mixers	12/Year	4/Year
• Wake Up Menifee w/ speaker	12/Year	6/Year
• Installation Awards	1/Year	1/Year
• Mayors Ball	1/Year	1/Year
• All Chamber Mega-Mixer	1/Year	1/Year
• Boys and Girls Club Fundraiser	1/Year	1/Year

Table 1. Public and Governmental Affairs Outreach Opportunities		
• Legislator Updates	Quarterly	Attend as needed
• Candidate Forum	1/Year	1/Year
City Meetings:		
City Council Meetings	24/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
City of Menifee Quarterly Utility Meeting	Quarterly	4/Year
Director Advisory Committee Meeting	3-4/Year	3-4/Year
Perris	**Frequency**	**Minimum Attendance**
Chamber of Commerce Events:		
• State of the City	1/Year	1/Year
• Chamber Mixers	12/Year	4/Year
• Wake Up Perris	12/Year	6/Year
• Installation Dinner	1/Year	1/Year
• Legislator updates	Quarterly	Attend as needed
• Economic Summit Event	1/Year	1/Year
• Candidate Forum	1/Year	1/Year
City Meetings:		
City Council Meetings	24/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
City of Perris Quarterly Utility Meeting	4/Year	4/Year
Director Advisory Committee Meeting	3-4/Year	3-4/Year
Mead Valley	**Frequency**	**Minimum Attendance**
Mead Valley MAC	4/Year	2/Year
Quail Valley	**Frequency**	**Minimum Attendance**
QVEC Annual Town Hall	1/Year	1/Year

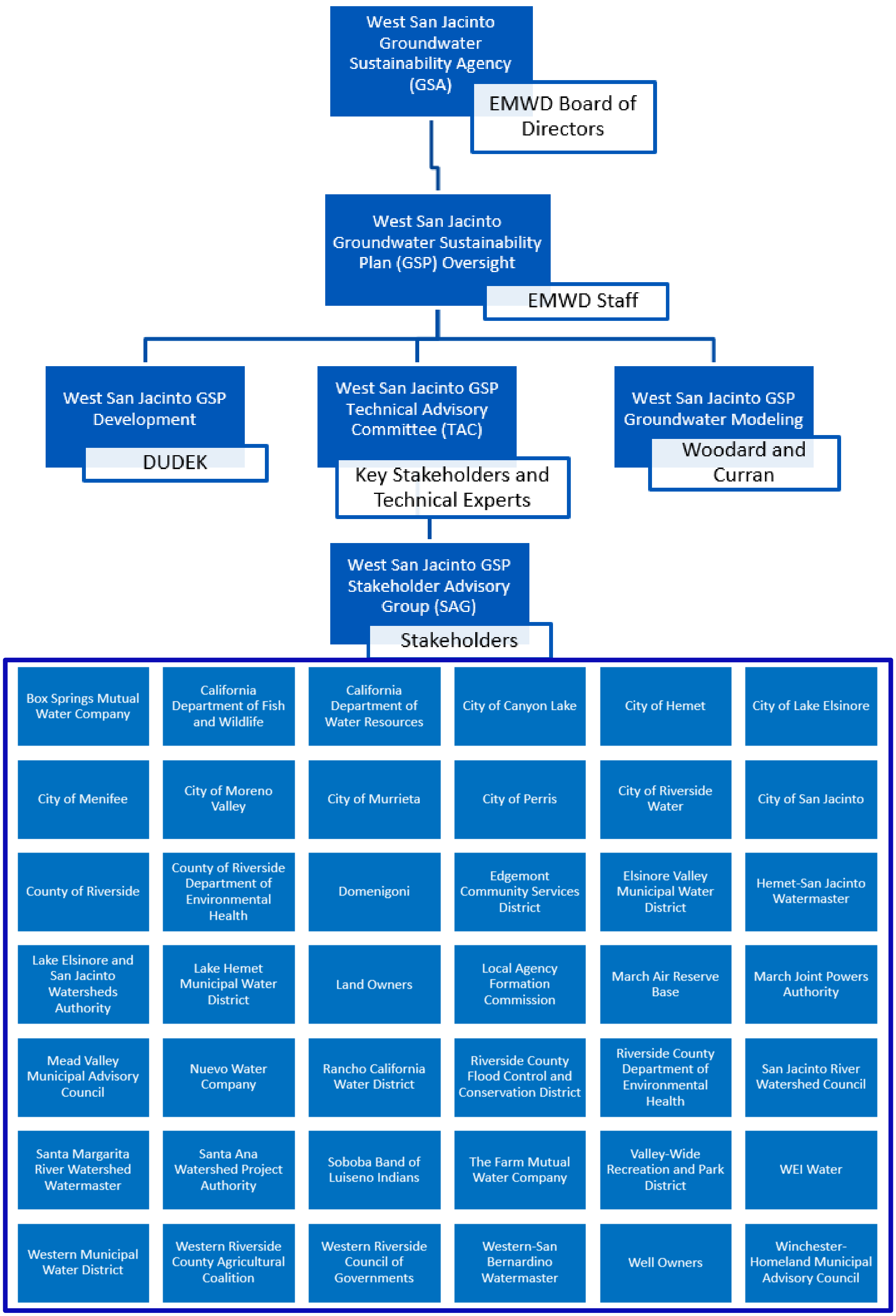
Table 1. Public and Governmental Affairs Outreach Opportunities		
QVEC Update Meetings	6/Year	6/Year
Murrieta	**Frequency**	**Minimum Attendance**
Chamber of Commerce Events:		
• State of the City	1/Year	1/Year
• Chamber Mixers	12/Year	4/Year
• Coffee w/the City Council	12/Year	4/Year
• Government Relations Committee	12/Year	Attend as needed
• Networking Breakfast	12/Year	4/Year
• Chamber Awards Gala	1/Year	1/Year
• Legislator Updates	Quarterly	Attend as needed
• Mega Chamber Mixer	1/Year	1/Year
• Economic Update Event	1/Year	1/Year
• Candidate Forum	1/Year	1/Year
City Meetings:		
City Council Meetings	24/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
Murrieta-Temecula Group	12/Year	6/Year and as needed
Temecula	**Frequency**	**Minimum Attendance**
Chamber of Commerce Events:		
• State of the City	1/Year	1/Year
• Chamber Mixers	12/Year	4/Year
• Government Relations Committee	12/Year	Attend as needed
• Networking Breakfast w/speaker	12/Year	4/Year
• Women in Business Event	1/Year	1/Year
• Installation Dinner	1/Year	1/Year
• Legislator updates	Quarterly	Attend as needed
• Southwest Economic Forecast	1/Year	1/Year
• Southwest Legislative Update Event	1/Year	1/Year
• Candidate Forum	1/Year	1/Year

Table 1. Public and Governmental Affairs Outreach Opportunities		
City Meetings:		
City Council Meetings	24/Year	1/Year and as needed
Planning Commission Meetings	12/Year	Attend as needed
City of Temecula Utility Coordination Meetings	4/Year	4/Year
Economic Development Coalition: EDC Board Member	12/Year	8/Year
• EDC Quarterly Speaker Events	4/Year	2/Year
Winegrowers Association Meeting	Quarterly	Attend as needed
Director Advisory Committee Meeting	3-4/Year	3-4 Year or as needed
French Valley	**Frequency**	**Minimum Attendance**
French Valley Town Hall	1/Year	1/Year
French Valley Movies in the Park Event (provide water fill station)	8/Year	1/Year
Sporting Opening Day	2/Year	1/Year
French Valley Airport Event (none scheduled for 2017 yet)	TBD	TBD
HOA Presentations (multiple HOA's in FV area)	6/Year	1/Year
County of Riverside	**Frequency**	**Minimum Attendance**
1st District Supervisor Forum	1/Year	1/Year
3rd District Supervisor Forum	1/Year	1/Year
5th District Supervisor Forum	1/Year	1/Year
State of the County	1/Year	As schedule permits

Presentations have been conducted in English and Spanish depending on the needs of the audience and materials have been translated to fit the audience need as well. EMWD's Public Affairs staff will continue to work to participate with the community and stakeholders throughout the region.

6.1 Stakeholder Advisory Group

A Stakeholder Advisory Group (SAG) was developed to provide feedback to the West San Jacinto GSA on materials being incorporated into the West San Jacinto GSP. Meetings of the SAG will be a central forum for stakeholder engagement throughout the GSP development process. In addition to the stakeholders within the GSA, neighboring stakeholders may also participate in SAG meetings, collaborate, and review the GSP as appropriate. All SAG meetings are open to members of the public. SAG meeting notices are distributed via email to individuals on the interested parties list as well as anyone that subscribes to the West San Jacinto GSA email distribution list through the EMWD website. The SAG comprises of representatives from Box Springs Mutual Water Company, California Department of Fish and Wildlife, California Department of Water Resources, City of Canyon Lake, City of Hemet, City of Lake Elsinore, City of Menifee, City of Moreno Valley, City of Murrieta, City of Perris, City of Riverside Public Utilities, City of San Jacinto, County of Riverside, County of Riverside Department of Environmental Health, Domenigoni, Edgemont Community Services District, Elsinore Valley Municipal Water District, Good Hope Municipal Advisory Council, Hemet-San Jacinto Watermaster, Lake Elsinore and San Jacinto Watersheds Authority, Lake Hemet Municipal Water District, Land Owners, Local Agency Formation Commission, Liberty Utilities, March Air Reserve Base, March Joint Powers Authority, Mead Valley Municipal Advisory Council, Nuevo Water Company, Rancho California Water District, Riverside County Flood Control and Conservation District, Riverside County Department of Environmental Health, San Jacinto River Watershed Council, Santa Margarita River Watershed Watermaster, Santa Ana Watershed Project Authority, Soboba Band of Luiseno Indians, The Farm Mutual Water Company, Valley-Wide Recreation and Park District, WEI Water, Western Municipal Water District, Western Riverside County Agricultural Coalition, Western Riverside Council of Governments, Western-San Bernardino Watermaster, Well Owners, Winchester-Homeland Municipal Advisory Council, and Other Stakeholders. Key EMWD Executive, Management, Public Affairs, Water Resource Planning, Engineering, Operations and Environmental staff also participate in the SAG meetings.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DUDEK
West San Jacinto GSP Technical Advisory Committee (TAC)
Key Stakeholders and Technical Experts
West San Jacinto GSP Groundwater Modeling
Woodard and Curran
West San Jacinto GSP Stakeholder Advisory Group (SAG)
Stakeholders
Box Springs Mutual Water Company
California Department of Fish and Wildlife
California Department of Water Resources
City of Canyon Lake
City of Hemet
City of Lake Elsinore
City of Menifee
City of Moreno Valley
City of Murrieta
City of Perris
City of Riverside Water
City of San Jacinto
County of Riverside
County of Riverside Department of Environmental Health
Domenigoni
Edgemont Community Services District
Elsinore Valley Municipal Water District
Hemet-San Jacinto Watermaster
Lake Elsinore and San Jacinto Watersheds Authority
Lake Hemet Municipal Water District
Land Owners
Local Agency Formation Commission
March Air Reserve Base
March Joint Powers Authority
Mead Valley Municipal Advisory Council
Nuevo Water Company
Rancho California Water District
Riverside County Flood Control and Conservation District
Riverside County Department of Environmental Health
San Jacinto River Watershed Council
Santa Margarita River Watershed Watermaster
Santa Ana Watershed Project Authority
Soboba Band of Luiseno Indians
The Farm Mutual Water Company
Valley-Wide Recreation and Park District
WEI Water
Western Municipal Water District
Western Riverside County Agricultural Coalition
Western Riverside Council of Governments
Western-San Bernardino Watermaster
Well Owners
Winchester-Homeland Municipal Advisory Council

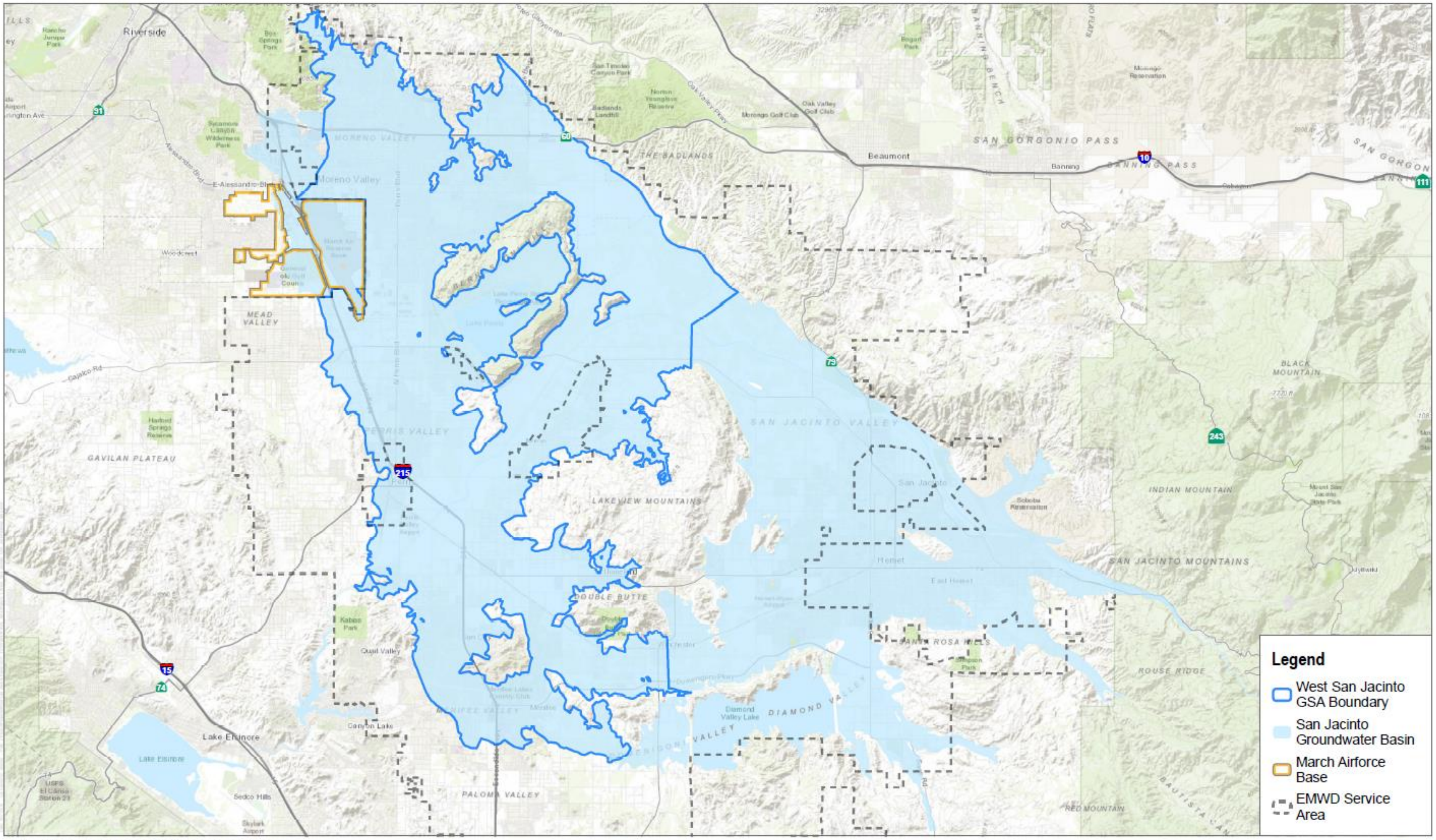
6.2 Meeting Opportunities

The West San Jacinto GSA meets as needed during scheduled EMWD meetings, generally held on the first and third Wednesday of each month at 9:00 am at 2270 Trumble Road in Perris, California[1]. The West San Jacinto Groundwater Basin SAG Meetings are held as needed and were held approximately quarterly during the development of the GSP. Meeting schedules and notices can be viewed online at https://www.emwd.org/post/sustainable-groundwater-management-act. The following summary of quarterly meetings took place during GSP development (Table 2). The West San Jacinto GSA will continue to reach out to the community and stakeholders are welcome at all EMWD meetings throughout the GSP implementation process.

Table 2. Quarterly Stakeholder Advisory Group Meetings

Meeting Date	Topic(s) of Discussion
June 26, 2019	SGMA Background and GSP Development
September 24, 2019	Historical and Current Conditions
January 14, 2020	Hydrogeologic Conceptual Model and Future Water Budget
July 14, 2020	Water Budgets, Representative Monitoring Points, and Groundwater Elevation Minimum Thresholds
October 14, 2020	Water Budgets, Groundwater Quality Minimum Thresholds, Undesirable Results, Projects and Management Actions
March 24, 2021	Review of the Draft GSP and Next Steps for Public Comment and Review
May 19, 2021	Draft GSP
August 25, 2021	Comments Received, Revisions, Final GSP and Board Hearing Date for GSP Adoption
September 15, 2021	West San Jacinto GSA Board GSP Adoption Hearing

[1] During 2020 and parts of 2021 meetings were held online to comply with State mandated social distancing guidance.



SOURCE: Esri, Eastern Municipal Water District, California Department of Water Resource

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FIGURE 1
West San Jacinto GSA Map

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6.3 GSP Engagement Summary

Roles, responsibilities, and opportunities for engagement throughout the GSP development and implementation process are summarized in Figure 2. The West San Jacinto GSA may provide additional opportunities or adjust the process as needed to meet the needs of stakeholders and/or the requirements of SGMA.

Figure 2: GSP Development Roles and Responsibilities

GSP Development Participants	Roles and Responsibilities for GSP Development
West San Jacinto Groundwater Sustainability Agency (EMWD Board of Directors):	• Oversee GSP development • Approve costs and budgets • Conduct public hearings • Consider stakeholder feedback • Adopt the GSP • Provide direction to GSA staff
West San Jacinto Groundwater Sustainability Agency Staff:	• Administer the GSA • Provide notice of public meetings • Oversee stakeholder meetings • Manage GSP consultants
West San Jacinto Groundwater Sustainability Agency Technical Advisory Committee (TAC): 	• Review technical components of GSP • Confer with other groundwater users and interested parties • Provide guidance to the GSA
West San Jacinto Groundwater Sustainability Agency Stakeholder Advisory Group (SAG) & Interested Parties: 	• Attend stakeholder workshops • Read electronic newsletters • Provide input on draft and final GSP • Provide guidance on GSP implementation policies and feedback on implementation impacts
GSP Consultant:	• Develop draft GSP components • Present information and make changes as directed by the GSA • Generate final GSP

7 CONTACT US

This document serves as a tool for facilitating public engagement in the GSP development and implementation process. It is designed to be a living document that is updated as needed to reflect current mechanism of engagement. West San Jacinto GSA will continue to use the communication tools outlined in this document as necessary through the implementation phase of the GSP.

For additional information regarding the West San Jacinto GSA and the GSP, please contact:

Rachel Gray, Water Resources Planning Manager
Phone: 951-928-3777 ext. 4514

Email: grayr@emwd.org

Mailing Address:
Eastern Municipal Water District
Attn: Rachel Gray, Water Resources Planning Manager
P.O. Box 8300
Perris, CA 92572-8300

Website: https://www.emwd.org/post/sustainable-groundwater-management-act

APPENDIX A: SGMA Requirements For Stakeholder Engagement

Stakeholder engagement is an important component of any successful long-term planning effort and is required by the SGMA (§ 10720 - § 10730) and GSP Regulations (§ 353 - § 354). This appendix provides a quick reference to how the West San Jacinto GSA will meet these requirements.

SGMA Requirement	West San Jacinto GSA
The GSA must encourage and support active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin. (SGMA § 10727.8)	Participation by the West San Jacinto Groundwater Basin Stakeholder Advisory Group (SAG)
The GSA must also allow for voluntary participation by Native American Tribes and the federal government (SGMA § 10720.3).	The Department of Defense March Air Reserve Base and March Joint Powers Authority have been invited to participate in the TAC and SAG.
The GSA must consider the interests of all beneficial uses and users of groundwater within the basin (SGMA § 10723.2).	Representatives from all applicable categories of uses and users as discussed in Appendix B have been invited to participate in the SAG.
The GSA may appoint and consult with an advisory committee (SGMA § 10727.8)	The TAC serves as the advisory committee to the West San Jacinto GSA.
Establish and maintain a list of interested parties (SGMA § 10723.4).	Interested parties can be added to the list by subscribing as discussion in section 6.1 of this plan.
Provide public notice of the GSA formation (SGMA § 10723(b)).	Publications in The Press Enterprise October 30, 2016 and November 20, 2016.
Notify DWR of the GSA formation (SGMA § 10723(b).	Uploaded to DWR Portal on January 24, 2017.
Conduct a GSA formation public hearing (SGMA § 10723(b).	Public hearing conducted on December 7, 2016.
Provide a written statement to DWR as well as the cities and counties within the GSA boundary, describing how interested parties may participate in the GSP development (SGMA § 10727.8).	Completed on June 26, 2019. Invitations were distributed to the SAG member list to participate in GSP development.
Submit initial notification of intent to prepare a GSP (GSP Regulations § 353.6).	Completed on August 29, 2018.

Prepare a GSP that considers beneficial uses and users of groundwater when describing undesirable results, minimum thresholds, projects and actions (SGMA § 10727.8, § 10723.2 and GSP Regulations § 354.10). The GSP must include a communication section that includes the following (GSP Regulations § 354.10): • Explanation of the GSA's decision-making process; • List of public meetings at which the GSP was discussed; • Identification of opportunities for public engagement and a discussion of how public input and response will be used; • Description of how the GSA encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin; • Description of how the GSA will inform the public about progress implementing the Plan, including the status of projects and actions.	Completed September 2021.
Public noticing and public meeting procedures prior to adopting, submitting, or amending a GSP (SGMA § 10728.4).	Completed June 2021.
Upon GSA adoption of the GSP and submittal to DWR, the GSP will be available on the DWR website for a 60-day public comment period. Any person may provide comments to the DWR on the GSP. DWR will consider the comments received prior to completing their evaluation and assessment of the GSP (GSP Regulations § 353.8).	To be completed by DWR.
GSA's must provide public notice and hold public meetings prior to amending the GSP (SGMA § 10730).	Completed June and September 2021.
Public notice is required before the GSA imposes or increases fees (SGMA § 10730).	To be completed if necessary, as discussed in the GSP.

APPENDIX B: List of Beneficial Uses and Users

In accordance with Section 10723.2 and Section 10723.8 (a)(4) of the SGMA, the following parties have or will be contacted to determine how best to consider and protect their interests throughout the formation of the GSA, development of a GSP, and implementation of the GSP. This list will continue to be updated during the development and implementation of the GSP.

These interests include, but are not limited to the following:

- Holders of overlying groundwater rights, including
    - Agricultural users: There are many agricultural wells within the GSA, most of whom have an existing relationship with the District. The District will communicate with landowners to assure that they understand their on-going opportunity to participate in the development of a GSP for the area.
    - Domestic water-well owners: There are some domestic wells within the GSA, however, the District anticipates that many will fall under SGMA's exclusions for de minimum extractors. As with agricultural users, the District will communicate with these landowners to assure that they understand their on-going opportunity to participate in development of a GSP for this area.
- Municipal Well Operators:
    - Eastern Municipal Water District
    - Western Municipal Water District
- Public Water Systems:
    - City of Perris
    - Motte Mutual Water Company
    - Nuevo Water Company
    - Box Springs Mutual Water Company
- Local Land Use Planning Agencies:
    - Riverside County
    - Riverside County Flood Control and Conservation District
    - City of Moreno Valley
    - City of Menifee
    - City of Perris
    - Liberty Utilities
    - Other Water and Irrigation Districts outside the GSA boundaries: The District provided courtesy notice of their intention to serve as the GSA to the City of Canyon Lake, Elsinore Valley Municipal Water District, Santa Margarita River Watermaster, and Hemet-San Jacinto Watermaster, and will continue to communicate with and solicit feedback from these neighboring agencies as the GSP is developed.
- Environmental Users of Groundwater:
    - California Department of Fish and Wildlife
- Surface Water Users:
    - Not applicable
- Federal Government:
    - March Air Reserve Base, Department of Defense
    - March Joint Powers Authority

- California Native American Tribes:
  - Not applicable
- Disadvantaged Communities:
  - The District actively works with these communities through their Public and Governmental Affairs, and Grant and Loans, Departments. The District will continue to coordinate with all Disadvantaged Communities within the GSA Boundary.
- Entities Listed in SGMA Section 10927 that are monitoring groundwater elevations in all or part of the groundwater basin managed by the GSA:
  - Eastern Municipal Water District Participates in the California State Groundwater Elevation Monitoring Program for the entire San Jacinto Groundwater Basin.

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APPENDIX G

San Jacinto Flow Model 2014 Documentation

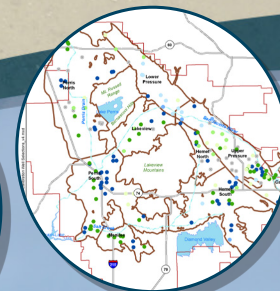
San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014)

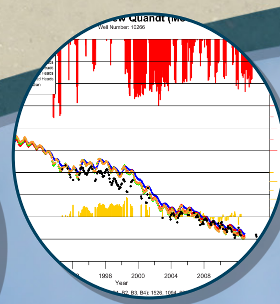
Hemet-San Jacinto Watermaster

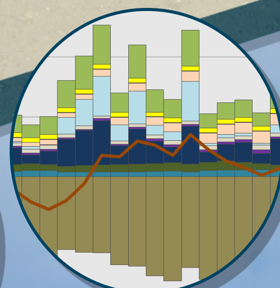
Eastern Municipal Water District
Since 1950

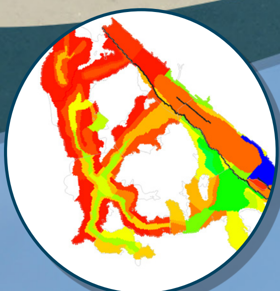
Final Report

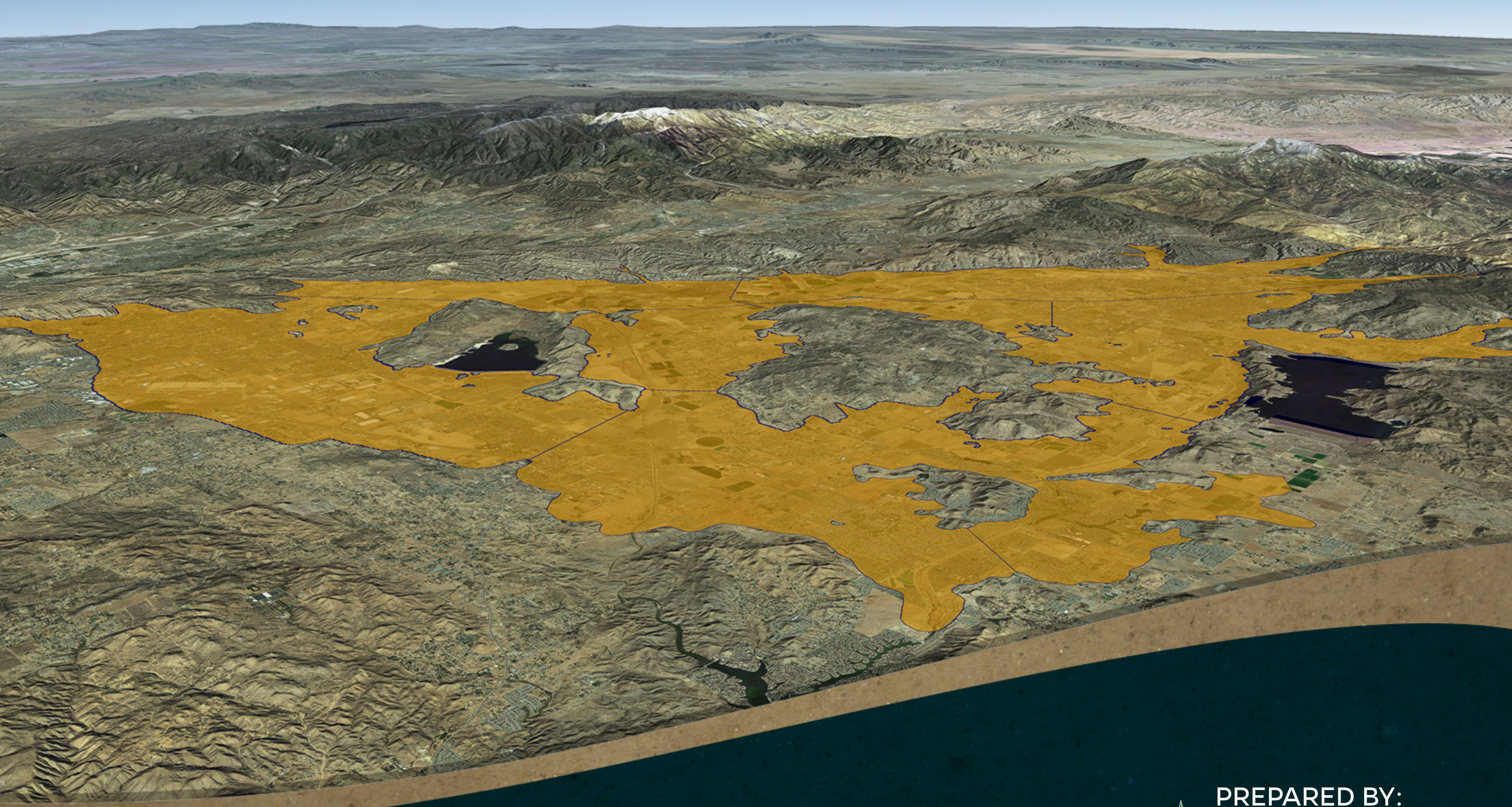
June 9, 2016











PREPARED BY:

RMC water and environment

San Jacinto Groundwater Flow Model Update- 2014 (SJFM-2014)

Model Development and Scenarios

FINAL REPORT

June 9, 2016

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Acknowledgements

The San Jacinto Groundwater Flow Model Update – 2014 (SJFM-2014) project was developed by RMC Water and Environment with funding contributions and technical support provided by the Eastern Municipal Water District (EMWD) and the Hemet-San Jacinto Watermaster Advisor. Additional funding was provided by the Western Riverside County Agricultural Coalition (WRCAC).

An advisory panel (AP) was formed to provide quality assurance and technical support for development of SJFM-2014. The involvement of the AP expedited the process of developing the SJFM-2014, resulting in a groundwater model widely accepted by the local stakeholders and public agencies. The AP consisted of representatives from the United States Geological Survey (USGS), California Department of Water Resources (DWR), Santa Ana Regional Water Quality Control Board (RWQCB).

The project team included:

- **EMWD**
  - Brian Powell, Project Director
  - John Daverin, Project Manager
  - Gordon Ng, Project Engineer
- **Hemet-San Jacinto Watermaster Advisor**
  - Behrooz Mortazavi
- **Advisory Panel**
  - Ralph Phraner, Consultant, Local Groundwater Expert
  - Tracy Nishikawa, USGS
  - Aleksander Vdovichenko, DWR
  - Cindy Li, RWQCB
- **Consultant: RMC Water & Environment**
  - Ali Taghavi: Project Manager
  - Reza Namvar: Lead Modeler
  - David Moering: Project Modeler

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Executive Summary

The goal of this project is to update the Eastern Municipal Water District's (EMWD) existing numerical groundwater modeling tool to provide a more accurate prediction of the effects of potential regional projects to the San Jacinto Groundwater Basin (Basin). Since completion of the San Jacinto Groundwater Flow and Transport Model in 2002 (SJFTM-2002), EMWD has built a groundwater dataset with additional monitoring locations and increased data collection frequency compared to the dataset that was available in 2002. The San Jacinto Groundwater Flow Model Update – 2014 (SJFM-2014) incorporates these additional data, which reflect the altered groundwater conditions that have developed since the conclusion of the 2002 model. This allows for a more complete and accurate assessment of Basin conditions to be used for planning and development of future projects and use within the Basin.

The 2014 model update was conducted by EMWD with technical and financial participation by the Hemet-San Jacinto Watermaster. EMWD retained an Advisory Panel (AP) to provide quality assurance and peer-review of the SJFM-2014.

The following major tasks were undertaken during the development of the SJFM-2014.

- Conceptual Groundwater Flow Model Development
- Numerical Groundwater Flow Model Development
- Model Calibration
- Groundwater Model Predictive (Future) Scenarios Analysis

Conceptual Groundwater Flow Model Development

The approximately 300 square-mile Basin falls almost entirely within EMWD's northern service area and is divided into eight Groundwater Management Zones (GMZs): Perris North, Perris South, Menifee, San Jacinto Lower Pressure (Lower Pressure), Lakeview/Hemet North, Hemet South, San Jacinto Upper Pressure (Upper Pressure), and San Jacinto Canyon (Canyon). For the purpose of this model, the Lakeview/Hemet North GMZ was evaluated as two separate GMZs: Lakeview and Hemet North. The GMZs are shown in Figure ES 1. In general, the GMZs are in hydraulic communication, meaning aquifer stresses in one GMZ will have an effect on surrounding GMZs, with the exceptions of Canyon GMZ and San Jacinto Upper Pressure GMZ which are bordered by no-flow or low-flow faults. The GMZs were defined in the 2004 San Ana River Basin Plan update by the Santa Ana Regional Water Quality Control Board based on variations of groundwater elevations, groundwater flow characteristics, and groundwater quality.

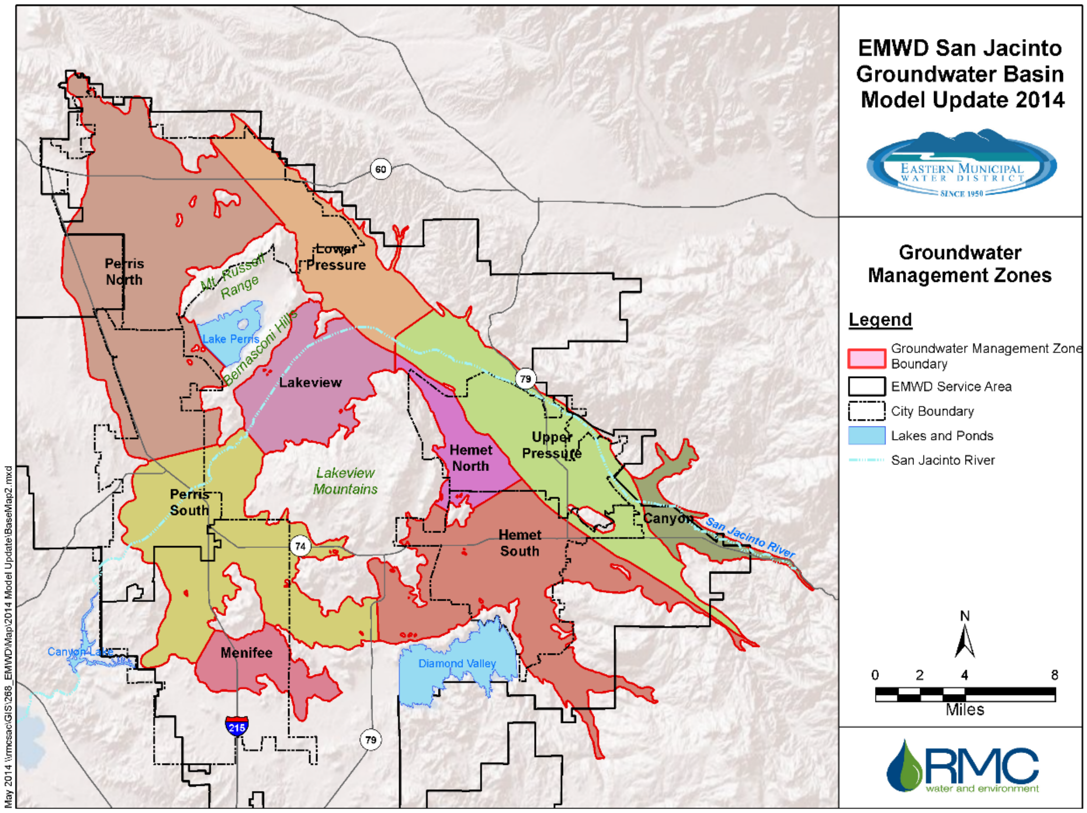

Figure ES 1: Groundwater Management Zones

Groundwater Inflows and Outflows

Groundwater inflows originating from within the basin are predominantly from infiltration. Sources affecting the overall water balance include: aerial rainfall infiltration, river recharge, mountain front recharge, surface water reservoirs and applied water. Groundwater production from pumping wells is the only major source of outflow in the model. There are 453 production wells within the active model area. The municipal wells are used to fulfill water demands for municipal, irrigation, industrial, and domestic water use. The remaining wells in the Basin are privately owned wells.

Groundwater Flow Model Development

The SJFM-2014 is a saturated groundwater flow model that is constructed using the U.S. Geological Survey's (USGS) MODFLOW-NWT groundwater flow code, a Newton formulation for MODFLOW-2005. Groundwater Modeling Systems (GMS) is used as the pre- and post-processing program. The simulation period of the SJFM-2014 spans 29 years from 1984 through 2012.

The SJFTM-2002 served as a basis for the initial set of aquifer parameters in the model. These parameters were adjusted throughout the calibration process to best fit the simulated model heads and the observed data in the SJFM-2014. These aquifer parameters are presented in Table ES 1.

Table ES 1: SJFM-2014 Aquifer Parameters and Descriptions

Parameter	Description
Horizontal Hydraulic Conductivity (K_h)	Initial values for the SJFM-2014 K_h parameters were updated during model calibration based on recent data. In general, the K_h distribution west of the Casa Loma Fault follows the bedrock contours, developed by the University of California, Riverside.
Vertical Hydraulic Conductivity (K_v)	K_v has the same spatial distribution as K_h. The K_v values are typically 10-13% of the K_h values established for the SJFM-2014.
Specific Yield	Specific yield is used to represent the storage in unconfined cells, typically in Layer 1. Initial parameters were adjusted during model calibration.
Specific Storage	Specific storage is utilized for storage in confined cells. Initial parameters were adjusted during model calibration.

The Basin receives recharge flows from distributed sources of applied water components including:

- Precipitation
- Water sales (EMWD, Subagency, Recycled Water)
- Irrigation return flow
- Point recharge (recharge ponds, reclamation storage ponds and surface water reservoirs)

The quantity of recharge from distributed sources is dependent on a) the percentage of pervious land surface and b) soil drainage properties. This applied water recharge is associated with the model using a recharge preprocessor.

The remaining groundwater recharge sources incorporated into the SJFM-2014 are river leakance and underflows from mountain front recharge.

Model Calibration

There were 197 calibration wells selected from an inventory of 601 wells with available historical groundwater levels. The selected calibration well set provides good geographic coverage of the Basin as well as good representation of each of the four model layers. The calibration well locations are shown in Figure ES 2.

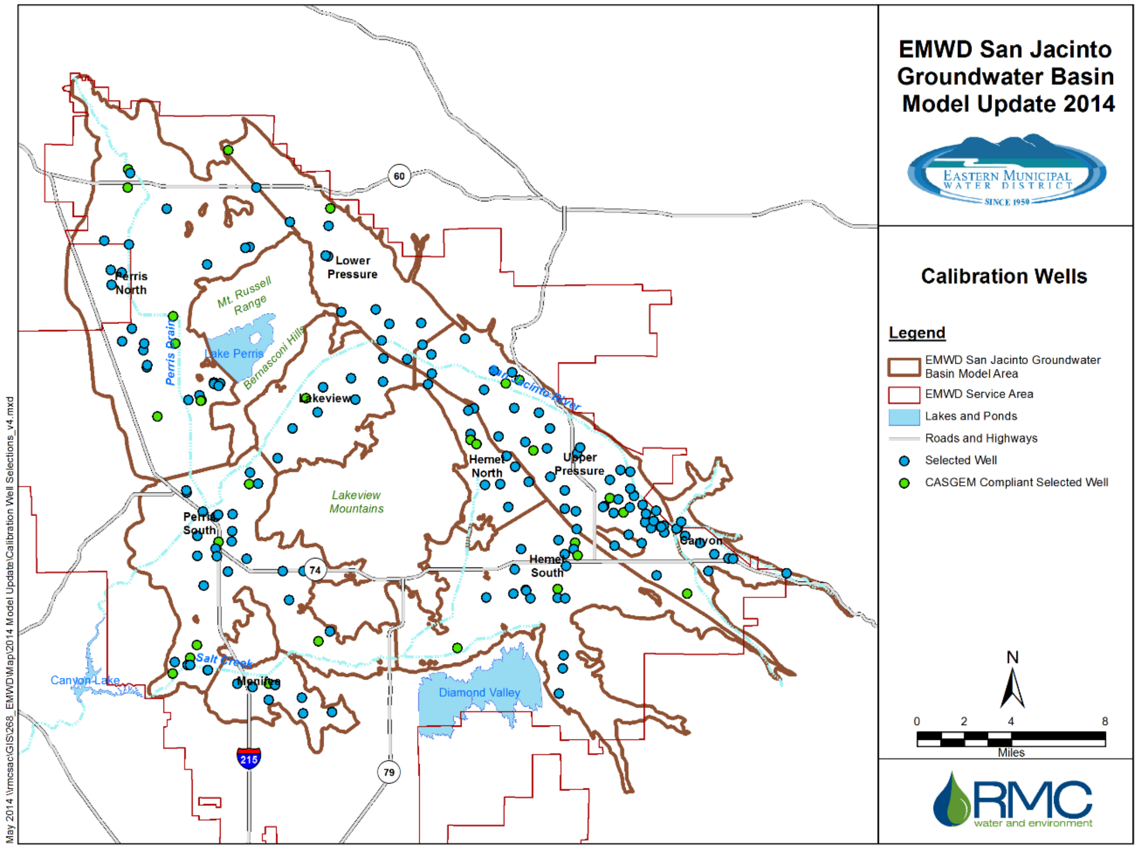

Figure ES 2: Locations of Selected Target Calibration Wells

The SJFM-2014 calibration status was measured using two metrics: simulated and observed groundwater level matching statistics and groundwater level trend matching. The statistics were evaluated to meet a reasonable statistical range meeting American Standard Testing Methods (ASTM) which states "the acceptable residual (observed minus simulated heads) should be a small fraction of the head difference between the highest and lowest heads across the site." Using 10 percent as the "small fraction", the acceptable residual level would be 30 feet or 10% of the 300+ feet of water level changes based on an intra-well water level analysis. The acceptable residual level was refined and groundwater level residuals were considered at a GMZ level as well as basin-wide. The calibration goals for the groundwater level residuals of the selected calibration wells in the entire model area were set to:

- 50% of residuals within +/- 20 feet
- 75% of residuals within +/- 30 feet

Calibration focused on all GMZs; however, more effort was spent on calibration in areas that are more challenging and complex from water supply and hydrologic perspective. This included important production areas, areas for future development and key GMZs in the Basin such as Perris North, the brackish groundwater wells in Perris South, the core production area in Hemet South, the intake area of Upper Pressure, and the Canyon GMZ. The calibration process included:

- Water budget calibration
- Steady state calibration
- Parameter evaluation
- Transient calibration
  - Groundwater level calibration
  - Groundwater trend calibration

Calibration Results

The calibration was conducted by adjusting aquifer parameters during the calibration process to optimize the simulation of the groundwater flow system in the Basin. The calibration process was reviewed by EMWD and the Advisory Panel and aquifer parameters were adjusted with their input.

The calibrated model simulated 62% of groundwater level residuals within +/- 20 feet and 74% of groundwater elevation residuals within +/- 30 feet. Most of the calibration wells in the areas of the Basin with significant groundwater production show average residuals are within +/- 20 feet. It should be noted that Lower Pressure is a heavily convoluted and complicated flow system with few apparent continuous aquifers, causing less accurate results than other GMZs in the Basin. Subsequently, the overall averages of the entire basin are reduced due to an area that is not planned for municipal groundwater extraction. Since the water resources within the Lower Pressure appear limited and installation of a groundwater production well is minimal due to the nature of the aquifers in this region, a limited amount of time was spent during calibration efforts and the results in Lower Pressure are of limited value. Without considering the Lower Pressure, the calibrated model simulated 65% of groundwater level residuals within +/- 20 feet and 75% of groundwater elevation residuals within +/- 30 feet.

The calibration goals were set for the entire model area; however, the statistics for all GMZs and the Hemet-San Jacinto and West San Jacinto Management Zones were also reviewed. Both calibration goals were achieved and surpassed for the GMZs in West San Jacinto Management Zone. As explained above, the calibration goals were not achieved in the Lower Pressure. The +/- 20 feet calibration goal was achieved in Hemet-San Jacinto Management Zone but the +/- 30 feet calibration goal was at 68%. This is, in part, due to the fact that in areas such as the Upper Pressure Intake area, clusters of wells within a small radius may have varying groundwater levels that cannot be captured by the regional SJFM-2014. Hydrograph trend matching is significant for these areas to illustrate that the regional trends of the area are being simulated, even if the individual groundwater levels in some of the wells are not exactly matched. Final calibration groundwater levels resulted in a good match to the observed groundwater trends for key areas and wells. The EMWD 28 Peacock Radaker well in Figure ES 3 demonstrates that the SJFM-2014 simulates these regional trends.

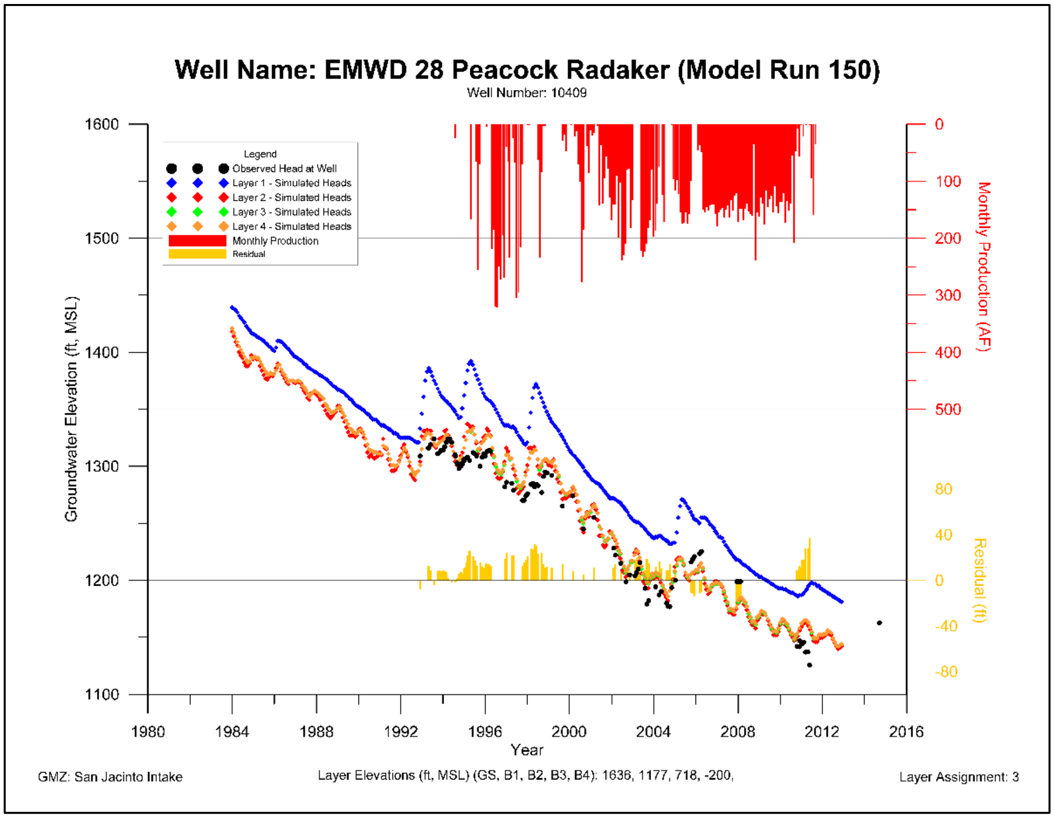

Figure ES 3: Calibration Hydrograph for EMWD 28 Peacock Radaker

Groundwater Model Predictive Scenarios

The calibrated SJFM-2014 Model was used for simulating the future conditions under various assumptions and conditions and as a comparative tool to determine the effects of various projects and alternatives. The study period for each scenario spans 29 years using the calibration period (1984 – 2012) as a basis and reordered based on scenario assumptions. Five different scenarios were evaluated:

- Baseline Scenario
- Scenario A: Optimize West San Jacinto Production
- Scenario B: Drought without Water Banking
- Scenario C: Drought with Constant Recharge from Water Banking
- Scenario D: Build-Out with Water Banking and 10-Year Hydrologic Cycles

Baseline Scenario

The Baseline Scenario propagated 2014 conditions into the future to use as a comparison with the SJFM-2014 as well as a basis for Scenario A through Scenario C. For the Baseline Scenario, several model components were modified, while others, such as the aquifer parameters, remained the same as the calibration model. These changes to the model components included:

- A revised hydrologic period

- Updated Land Use based on future projections
- Future applied water quantities based on EMWD projections
- 13 new production wells
- Two new recharge ponds in Perris South
- Soboba Settlement water recharged at the Integrated Recharge and Recovery Program (IRRP) ponds

Baseline Scenario Results

In the Basin, cumulative storage stabilizes under Baseline conditions, with the exception of the later years when storage increased due to above average rainfall, streamflows and the combination of increased recharge due to imported water at the IRRP along with stabilized production. The increase in storage correlates to the significant effect of San Jacinto River recharge in Upper Pressure and Canyon during wet years. In the West San Jacinto Management Area, stabilized storage values were exhibited. These stabilized storage values were expected for the overall groundwater basin Baseline conditions due to the implementation of basin management plans and basin adjudication (Hemet – San Jacinto Management Area) developed to minimize overdraft conditions and promote sustainable groundwater use prior to the scenario start date. The baseline scenario is to be used as basis of comparison for the results of several other model scenarios.

Scenario A - Optimize West San Jacinto Production

The purpose of Scenario A was to evaluate and optimize the production of potable and desalinated groundwater in the West San Jacinto Area relative to the Baseline Scenario. This included the construction of two news wells and increased groundwater production rates in the Perris Valley relative to the Baseline. In order to support the increased groundwater production, recharge rates were increased in Perris South at the Skiland Ponds.

Scenario A Results

Scenario A produces localized results in Perris North, Perris South and Lakeview, where the increases in production and recharge rates were applied. The main results of Scenario A include:

- A decrease in water levels in southern portion of Perris North and northern portion of Perris South. Groundwater elevations drop by approximately 25 feet by 2041, relative to the Baseline Scenario.
- An increase in water levels by 20-30 feet near the Skiland ponds in Perris South and east into Lakeview
- Similar water levels relative to the Baseline Scenario in the central portion of Perris South, attributed to the balance of the increased production and recharge in the Scenario.
- The other GMZs in the basin do not exhibit any significant changes in water levels relative to the Baseline.

Scenario B – Drought without Water Banking

Scenario B focuses on the effects of a drought hydrology and tests the sustainability of groundwater supplies in times of increased reliance on groundwater production. In Scenario B, it is assumed that an extended drought will occur over six consecutive years from 2025 to 2030, reducing the rainfall and local streamflows. Rainfall during this period is recorded as less than 10 inches per year.

Scenario B Results

The six-year drought caused a reduction in water levels throughout the entire basin. The Upper Pressure and Canyon GMZs are most affected by the drought, averaging a decrease in water levels by 8 and 18 feet during the drought period, respectively. This is a reflection on the impact of river recharge in the two GMZs. The other GMZs experience much smaller decrease in water levels, no more than 3 feet. Water levels in the Basin generally recover back to Baseline conditions by the end of the study period in 2041.

Scenario C - Drought with Constant Recharge from Water Banking

Scenario C evaluates the feasibility of a groundwater banking project in the San Jacinto Valley in conjunction with the six-year drought introduced in Scenario B. The main assumptions of this scenario are as follows.

- Add one new well in the San Jacinto Valley every two years starting in 2017 until 11 new wells have been installed
- Increase recharge to offset new pumping above ABPR
- Maintain a banked water balance of 5,000 AF by following the recharge schedule below.
    - 24,000 AFY recharged during dry years (less than 10 inches of rainfall)
    - 54,000 AFY recharged during wet or normal years
    - 7,500 AFY of the totals enumerated above recharged to the IRRP ponds each year to satisfy the Soboba Settlement (same as baseline) – remaining recharge amount to be recharged at three new Mountain Avenue Ponds

Scenario C Results

The increased recharge from the groundwater banking project has significant effects in Upper Pressure and surrounding basins. During the drought period, the increased recharge caused water level increases as high as 200 feet relative to Scenario B in areas in Upper Pressure. This rise in water levels in Upper Pressure also caused a rise in water levels in the hydraulically connected Lower Pressure and Hemet South GMZs. By simulation year 15, the addition of new production wells started to balance out the effects of the increased recharge, but by the end of the simulation, Scenario C water levels still remained higher than Scenario B.

Scenario D – Build-Out with Water Banking and 10-Year Hydrologic Cycles

Scenario D is used to create a different comparative base and is a stand-alone scenario not to be compared with the other scenarios. For Scenario D, a new hypothetical and repeating 10-year hydrology (three wet years, four average years and three dry years) is created while combining the changes in production and recharge model components of Scenarios A through C, with no phasing of projects.

Scenario D Results

Although Scenario D is a stand-alone scenario, it should be noted that the cumulative storage levels reacted similarly to those in the Baseline Scenario. The West San Jacinto Management Area storage were mostly stabilized with a slight negative trend, as the added recharge and pumping in the area balanced out. The Hemet-San Jacinto Management Area follows the trend of the rainfall and streamflows, reinforcing the significant effect of San Jacinto River recharge in Upper Pressure and Canyon.

Summary and Recommendations

Technical appropriateness, credibility, and defensibility of SJFM-2014 Model have been reviewed by EMWD staff, the Advisory Panel, Hemet-San Jacinto Watermaster Advisor via several technical review workshops. Their comments were incorporated in the development of the model. Comments on the final model calibration regarding future updates to the model have been gathered and summarized.

SJFM-2014 Model is a state-of-the-art water resources management regional model of the San Jacinto Groundwater Basin that integrates the surface water hydrologic system, the groundwater aquifer system, and the land surface processes (precipitation and irrigation) into a single model. It allows the water managers and decision makers to evaluate the effect of changes to the agricultural and/or municipal water demands, land use and water use, groundwater pumping, imported water, and other water planning measures. SJFM-2014 is an important analytical tool for evaluation of the water management programs in the San Jacinto Groundwater Basin.

The SJFM-2014 Model is reasonably calibrated to be used for the water resources planning and management applications in the San Jacinto Groundwater Basin such as:

- Assessment of conjunctive use projects
- Evaluation of effectiveness of water banking and transfer projects
- Assessment of recycled water use in agricultural and/or urban areas
- Evaluation of climate change adaptation and mitigation measures
- Development of Groundwater Sustainability Plans (GSPs) as part of requirements of the Sustainable Groundwater Management Act (SGMA)

The intended use of the SJFM-2014 Model is for analysis of water planning and management scenarios at a regional scale. However, detailed local conditions could be simulated using more site-specific models which can be linked to the SJFM-2014 Model. A recent example is use of SJFM-2014 Model for development of the detailed model for analysis of the Integrated Recharge and Recovery Program (IRRP) project in the Upper Pressure GMZ.

The SJFM-2014 does not currently include water quality modeling capabilities; however, it provides the fundamental data and framework, as well as appropriate level of spatial and temporal details for future development of its water quality component and simulation of transport of total dissolved solids (TDS) and nitrate.

Comprehensive water resources datasets have been developed as part of EMWD and other agencies data collection efforts. These datasets were used significantly in development and calibration of the SJFM-2014 Model. As these data collection efforts continue in the future, additional data would become available for updates of SJFM-2014 Model, which would improve the capability of the Model to simulate the regional surface water and groundwater conditions in the model area more accurately. The potential future data may include the following:

- Groundwater and surface water data updates
    - This data update includes groundwater elevation data at location with limited water level data, model layer specific water level data, and improved estimates of groundwater and surface water inflow quantities.
- Stratigraphy and geology data update
    - This data update includes for improved estimation of model layer thicknesses and model constructs.
- Water quality model update for simulation of transport of TDS and nitrate.

Section 1 Introduction

1.1 2002 Model

The 2014 model update is based on the existing and regulatory accepted San Jacinto Groundwater Flow and Transport Model, originally developed in 2002 (SJFTM-2002)[1] as a regional groundwater flow and transport model of the San Jacinto Groundwater Basin (Basin). SJFTM-2002 model is a high quality, regional planning tool that was peer-reviewed during its calibration in 2002. SJFTM-2002 was the third groundwater model that was developed for the entire Basin. Several previous groundwater models have been constructed for parts or the entirety of the Basin (Table 1).

Table 1: Modeling Efforts for the San Jacinto Groundwater Basin

Year	Model Area	Simulation Period	Consultant	Client
1975	Entire Basin and Water Quality	1963-1972	WRE & Kreiger and Stewart	SWAPA
1991	Canyon, Upper Pressure, Lower Pressure Flow, and Water Quality	1963-1983	UCLA	MWD, EMWD, SWAPA
1995	Hemet Flow and Water Quality	Data Collection	UCLA	MWD, EMWD
1998	Entire Basin	1972-1991	DHI	EMWD
2001	Perris North and March Air Reserve Base (MARB)	1993-1999	Tetra Tech	MARB
2002	San Jacinto Groundwater Basin	1984-1999	TechLink	EMWD
2014	San Jacinto Groundwater Basin	1984-2012	RMC	EMWD, Watermaster

SJFTM-2002 was developed based on the modeling platform of the Groundwater Modeling System (GMS) as pre- and post-processor, MODFLOW as groundwater flow model and MT3D as groundwater transport model. SJFTM-2002 was developed based on 16 year hydrology of 1984-1999 period. Three management scenarios were developed to evaluate the impact of recharge projects, decreased municipal groundwater extraction, high TDS groundwater extraction by brackish groundwater wells and movement of TDS plume from Perris South to Lakeview. This project updated the SJFTM-2002 with additional water level, lithologic, and hydrologic data collected since its completion.

1.2 Goals of Model Update

The goal of this project was to develop a peer-reviewed numerical groundwater model update that will help manage the groundwater basin from both a local and regional perspective as well as maximize

[1] This model is referred to as Regional Groundwater Model for the San Jacinto Watershed Model in the model documentation; however, SJFTM-2002 acronym is used for the 2002 model in this report for consistency with the acronym used for 2014 model update.

regional utilization of the basin in a responsible and sustainable manner. It will also be used for overdraft estimation and determination of the Basin safe yield. The update to SJFTM-2002 will allow for more accurate modeling of the potential effects of proposed regional projects, which in turn will support planning efforts to maximize the benefits to the Basin. Since the completion of the SJFTM-2002, successful implementation of the monitoring component of the Hemet-San Jacinto Groundwater Management Plan has allowed EMWD to build a groundwater dataset with more monitoring locations and increased data collection frequency compared to the dataset that was available in 2002. In addition, changes in groundwater production have caused water levels in the Basin to change significantly, with declines of up to 400 feet in some areas, while remaining steady or even increasing in other areas. The San Jacinto Groundwater Flow Model Update – 2014 (SJFM-2014) incorporated these additional data, which reflect the altered groundwater conditions that have developed since the completion of SJFTM-2002. This allows for a more complete and accurate assessment of Basin conditions to be used for planning and development of future projects and use within the Basin. SJFM-2014 could be used in support of projects and analyses by stakeholders in the area such as: Hemet-San Jacinto Watermaster; Cities of Perris, San Jacinto, and Hemet; Lake Hemet Municipal Water District as well as regional (i.e. Santa Ana Watershed Project Authority (SAWPA), Santa Ana Regional Water Quality Control Board (SAWQCB)) and State agencies.

1.3 Model Development Partners

The 2014 model update was conducted by EMWD with technical and financial participation by the Hemet-San Jacinto Water Management Area Watermaster (Watermaster). In addition, the Western Riverside County Agricultural Coalition (WRCAC) was a financial participant. Both EMWD and the Watermaster will be using the model for evaluation of effectiveness and impacts of various water supply projects; however, EMWD maintains ownership of the model and anticipates maintaining the model for the long-term use of local and regional stakeholders.

1.4 Advisory Panel

EMWD retained an Advisory Panel (AP) to provide quality assurance and peer-review of the SJFM-2014. The AP was comprised of four experts and local stakeholders with appropriate technical background. The AP members are as follows.

Table 2: SJFM-2014 Advisory Panel Members

Name	Organization
Cindy Li	Santa Ana Regional Water Quality Control Board
Tracy Nishikawa	United States Geological Survey
Ralph Phraner	Consultant, Local Groundwater Expert
Aleksander Vdovichenko	California Department of Water Resources

The AP reviewed the development and refinement of various components of the SJFM-2014. These components included the physical construction of the model (e.g., model layering), the initial aquifer parameters (e.g., conductivity), the initial recharge parameters (e.g., percolation of applied water), and model calibration. The involvement of the advisory panel during the development of the SJFM-2014 ensured a quality model and allowed developers to expedite the process of assembling a groundwater model that would be widely accepted by local stakeholders and public agencies. There were six AP workshops used to discuss model development and acquire feedback from the AP as well as share the planned direction of work on the SJFM-2014 development and calibration. Model workshops ranged in duration between 3 hours and 9 hours each.

The calibration process took about 9 months to complete and the modeling team moved into scenario development once concurrence on model calibration was acquired from the AP. While there is always room for improvement in models the majority of comments received by the AP were positive and constructive in nature. Comments received regarding potential shortcomings of the model were addressed as much as possible but primarily focused on lack of data in given area of the model. These comments will be the subject of future data gathering efforts and will be addressed in a more comprehensive manner in the next model update.

Summaries of the AP workshops, including comments received from AP members and their general acceptance of the model calibration as well as their comments on the SJFM-2014 Model report, are provided in Appendix F.

1.5 Potential Model Applications

The SJFM-2014 is anticipated to be used in the evaluation of various projects based on their relative benefits to the Basin, such as impact on declining water levels, against their cost and ease of implementation. Simulation runs of the model may also be used to optimize the projects themselves. For example, identification of location for replenishment programs may use information derived from simulation runs in order to make use of areas with particularly high percolation rates to target areas where recharge could improve existing groundwater quality. Information gathered from simulation runs can also assist the region in forecasting the future availability of groundwater while planning for future water demands.

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Section 2 Conceptual Groundwater Flow System

The Conceptual Groundwater Flow System provided an updated configuration and overall technical understanding of the groundwater conditions in the Basin to support the update and development of the SJFTM-2002. This incorporated a comprehensive compilation of data that included:

- Basin Hydrology
- Land Use Conditions
- Soil Types
- Geology
- Groundwater Inflows
- Groundwater Outflows

These data are further discussed in the following sections.

2.1 San Jacinto Groundwater Basin

The San Jacinto Groundwater Basin (Basin) is located in the western portion of Riverside County in Southern California and is about 70 miles southeast of the City of Los Angeles. The Basin is comprised of sedimentary aquifers within the Perris Block and San Jacinto Graben bounded by the Mead Valley Plateau to the west, the Santa Rosa Plateau to the south, the Box Springs mountains to the north, the San Jacinto Mountains to the east (all are primarily crystalline bedrock) and the San Timoteo Hills to the northeast (primarily fine-grained sediments). The bedrock surrounds and extends above the sediments within the Basin. The bounding bedrock and fine-grained sediments combine to effectively define the Basin to be a closed groundwater basin. The 235 square-mile Basin falls almost entirely within the EMWD service area. The Basin includes a portion of the Soboba Band of Luiseño Indian Reservation and the cities of Moreno Valley, Perris, Menifee, San Jacinto, and Hemet as shown in Figure 1. The EMWD service area extends to areas outside the San Jacinto Basin where primarily wastewater services are provided along with interties from The Metropolitan Water District of Southern California (MWD) to other purveyors outside the Basin.

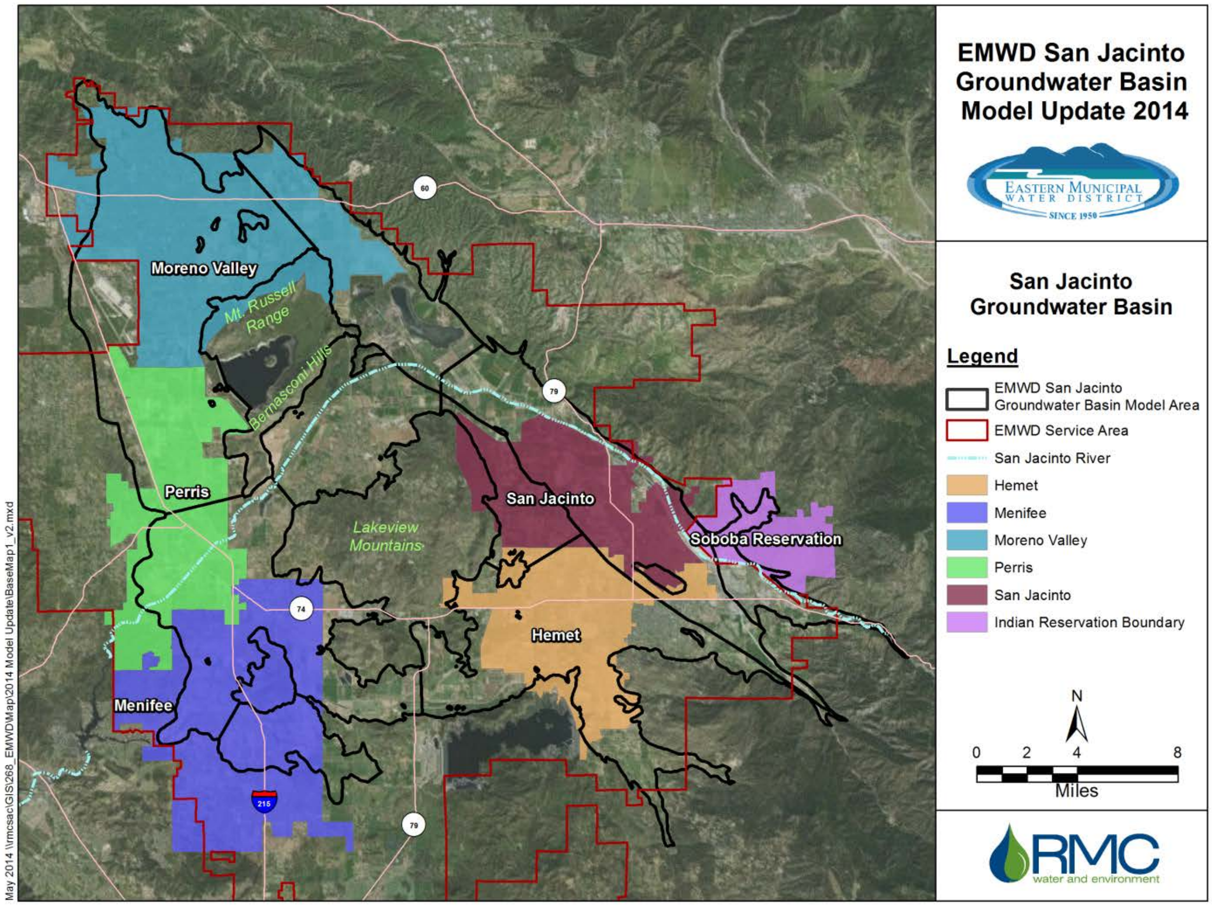


Figure 1: San Jacinto Groundwater Basin Boundary

The Basin is the source of groundwater production for EMWD and several other water purveyors. It is divided into the following eight Groundwater Management Zones (GMZs) as defined in the 2004 San Ana River Basin Plan update by the Santa Ana Regional Water Quality Control Board based on variations of groundwater elevations, groundwater flow characteristics, and groundwater chemistry.

- Perris North
- Perris South
- Menifee
- San Jacinto Lower Pressure (Lower Pressure)
- Lakeview/Hemet North
- Hemet South
- San Jacinto Upper Pressure (Upper Pressure)
- San Jacinto Canyon (Canyon)

For the purpose of this model, the Lakeview/Hemet North GMZ was evaluated as two separate GMZs: Lakeview and Hemet North. The Lakeview/Hemet North GMZ will be referred to separately as Lakeview and Hemet North hereafter in this report. All Basin GMZs are shown in Figure 2.

In general, surface water flows towards Canyon Lake, located to the southwest of the Basin and west of Perris South (Figure 2). Flow from the southeast portion of the Basin flows both north and south around the Lakeview Mountains before ultimately discharging into Canyon Lake. The groundwater flow trends and directions in some areas of the Basin are different than surface water flows. The groundwater flow trends follow the contours of the bedrock valleys. Generally, the groundwater flows in the western part of the Basin (Perris North, Perris South, Menifee, Lakeview, Hemet North, and Hemet South) flow towards Lakeview, where the depth to bedrock is deepest. In the eastern part of the Basin (Lower Pressure, Upper Pressure and Canyon), groundwater flows towards the intake area of Upper Pressure, near the shared boundary with Canyon, which is one of the main production areas in the entire Basin.

The GMZs are managed under two groundwater management plans that divide the Basin into the following management areas (Figure 3).

- Hemet-San Jacinto Groundwater Management Area
- West San Jacinto Groundwater Management Area

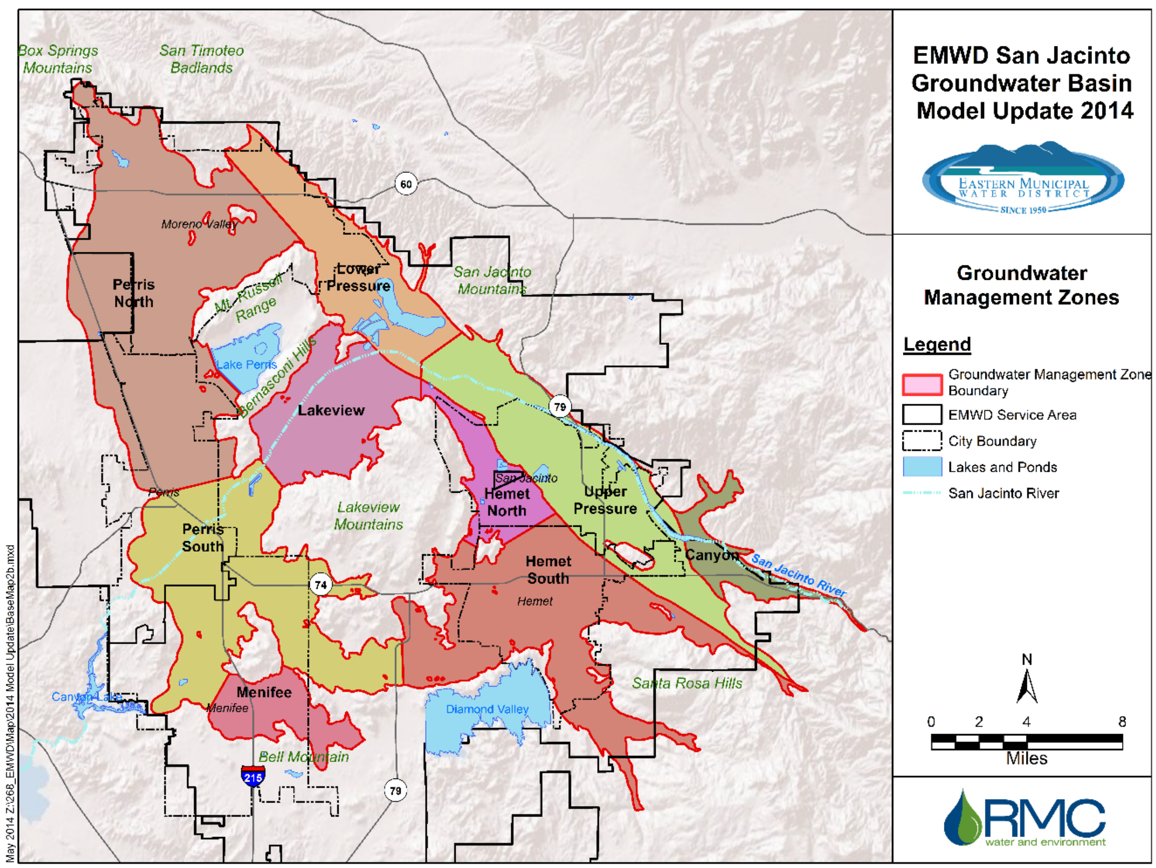


Figure 2: San Jacinto Basin Groundwater Management Zones

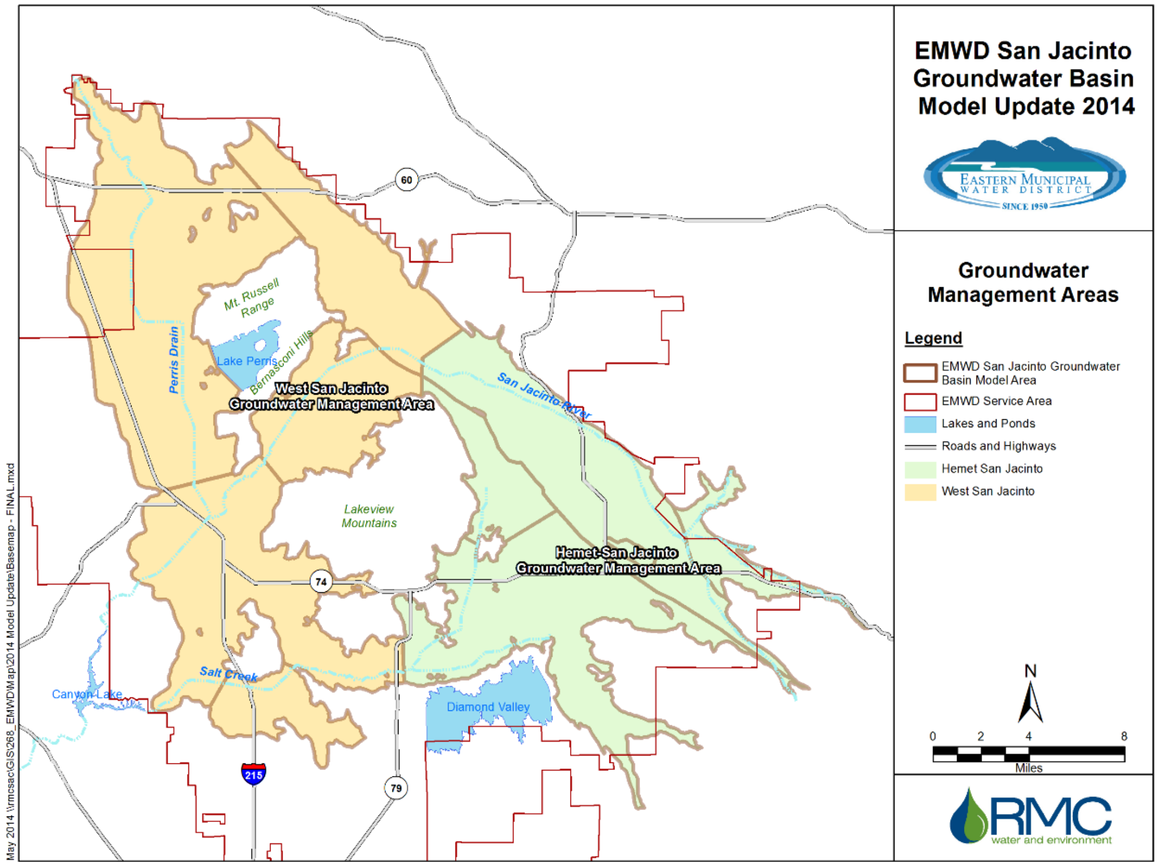


Figure 3: Groundwater Management Areas

2.1.1 *Hemet-San Jacinto Groundwater Management Area*

The Hemet-San Jacinto Water Management Area encompasses the southeastern portion of the Basin, consisting of Hemet North, Hemet South, Upper Pressure, and Canyon GMZs. The area includes the Cities of San Jacinto and Hemet, as well as the unincorporated areas of Winchester, Valle Vista, and Cactus Valley.

In June of 2001, a Memorandum of Understanding (MOU) between the California Department of Water Resources (DWR) and the local agencies was executed to cooperatively formulate a comprehensive water management plan for the Hemet-San Jacinto area.

The Hemet-San Jacinto Water Management Area is governed by the Water Management Plan[2]. The Water Management Plan has eight primary goals:

- Address pumping overdraft and declining groundwater levels
- Provide for Soboba Band of Luiseño Indians' prior and paramount water rights
- Ensure reliable water supply

[2] - Eastern Municipal Water District, Hemet/San Jacinto Groundwater Management Area 2013 Annual Report
- Eastern Municipal Water District, Water Management Plan for Hemet/San Jacinto Groundwater Management Area, 2007

- Provide for planned urban growth
- Protect and enhance water quality
- Develop cost-effective water supply
- Provide adequate monitoring for water supply and water quality
- Supersede the Fruitvale Judgment and Decree

In April 2013, a Stipulated Judgment and Complaint (Judgment), Case Number RIC 1207274 was entered with the Superior Court of the State of California for the County of Riverside adopting the Water Management Plan and creating the Watermaster. The Watermaster Board is the governing body for the Management Area and is comprised of elected officials representing the Cities of Hemet and San Jacinto, LHMWD, EMWD, and a representative for the private groundwater producers.

Each year, an annual report is prepared by the Watermaster. The report describes the status of the Water Management Plan implementation, discusses water supplies and project demands for the Management Area, reviews groundwater monitoring data, presents information on recharge programs, and reviews financial considerations.

The Stipulated Judgement estimates the groundwater safe yield of the Management Area to be approximately 45,000 AF per year[3]. The Stipulated Judgement also estimates the long-term basin overdraft to be approximately 10,000 AF per year[4].

2.1.2 *West San Jacinto Groundwater Management Area*

The West San Jacinto Groundwater Management Area encompasses the area on the western side of the Basin, consisting of Perris North, Perris South, Menifee, San Jacinto Lower Pressure, and Lakeview GMZs. The area includes the cities of Moreno Valley, Menifee and Perris, as well as unincorporated areas of Lakeview, Nuevo and Winchester.

The Groundwater Management Plan for the West San Jacinto Groundwater Management Area was adopted in 1995 and includes an Advisory Committee that studies and reviews all Management Plan activities; assists in developing rules and regulations for the Management Plan and for groundwater resources evaluation projects; and evaluates feasibility plans, demonstration projects, and implementation plans. The Advisory Committee consists of representatives of the cities, water purveyors, and private groundwater producers within the area.

An Annual Report is produced each year by EMWD in accordance with the Groundwater Management Plan and documents changes in water levels, water chemistry, groundwater basin related activities and implementation of previously identified recommendations during the past year.

[3] Hemet/San Jacinto Groundwater Management Area 2014 Annual Report. Prepared for Hemet-San Jacinto Watermaster by Eastern Municipal Water District, May 2015.

[4] Hemet/San Jacinto Groundwater Management Area 2014 Annual Report. Prepared for Hemet-San Jacinto Watermaster by Eastern Municipal Water District, May 2015.

2.1.3 *Water Purveyors in San Jacinto Groundwater Basin*

There are six main water purveyors in the Basin:

- Eastern Municipal Water District (EMWD)
- Lake Hemet Municipal Water District (LHMWD)
- City of San Jacinto Water Department
- City of Hemet Water Department
- Nuevo Water Company
- City of Perris/Perris Public Utilities

The EMWD direct potable and raw water sales service area is the largest of all the purveyors and spans through the majority of the Basin. With the exception of the Nuevo Water Company and City of Perris, which covers areas in Lakeview, Perris North and Perris South GMZs, the other water purveyors are located in the southeastern portion of the Basin, in Hemet South, Upper Pressure and Canyon GMZs, as shown on Figure 4.

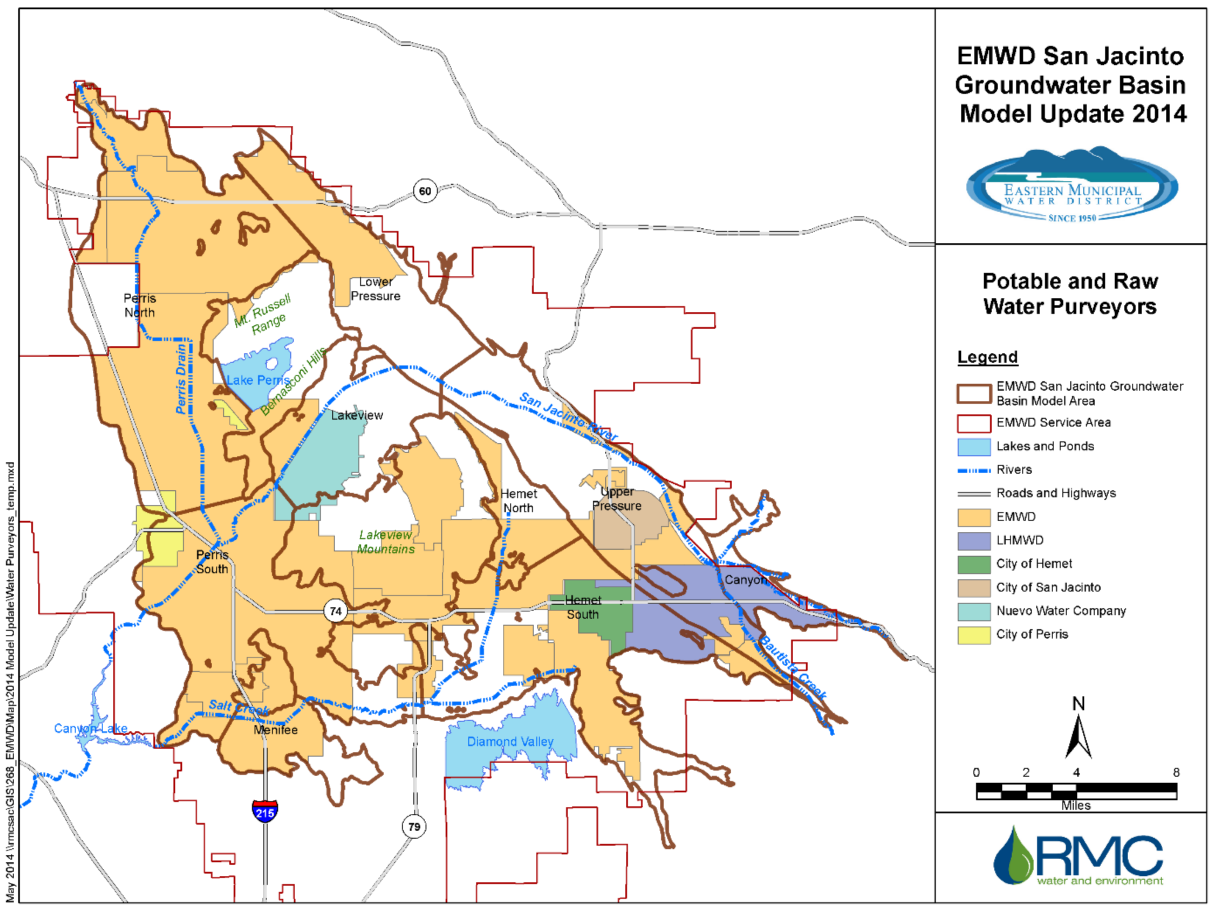


Figure 4: Retail Portable and Raw Water Purveyors in the Basin

2.2 Basin Hydrology

Hydrologically, the Basin has two outflow points, the San Jacinto River and Salt Creek, which flow into Canyon Lake. Hydrogeologically, the Basin is a closed groundwater basin with no significant natural subsurface outflows. The Basin geology is further discussed in Section 2.3.

Groundwater within the Basin predominantly originates from infiltration of precipitation, river recharge, and applied water sources. There are six waterways within the Basin, all of which are ephemeral streams: The San Jacinto River, Bautista Creek, Indian Creek, Poppet Creek, Perris Drain and Salt Creek. All aforementioned creeks are tributaries to the San Jacinto River with the exception of Salt Creek. The San Jacinto River is the largest river and in turn has the largest contribution of infiltration to groundwater. The San Jacinto River enters the Basin in the southeastern part of the Basin through the Canyon GMZ. It flows north and then west, terminating in Canyon Lake (Figure 4). Typically, streamflows percolate to groundwater in the form of seepage in the Upper Pressure and Canyon GMZs. In wet years, streamflows continue downstream of Upper Pressure GMZ, past Bridge Street. The San Jacinto River may overflow during a 25-year flood event first into Canyon Lake then into Lake Elsinore. When Lake Elsinore is full it overflows into Temescal Creek and into the Santa Ana River just upstream from Prado Dam in Corona, California.

Water also enters the groundwater system from seepage underflows from reservoirs such as Perris Lake and Diamond Valley Lake.

Precipitation is variable in the Basin and a majority of it occurs during the late fall and winter months (i.e., between October and March). Precipitation is generally greater in higher elevation areas and lower in the valley. The long-term average annual precipitation for the Basin is about 12.8 inches/year. Figure 5 presents the annual precipitation at the San Jacinto Gauge #186.

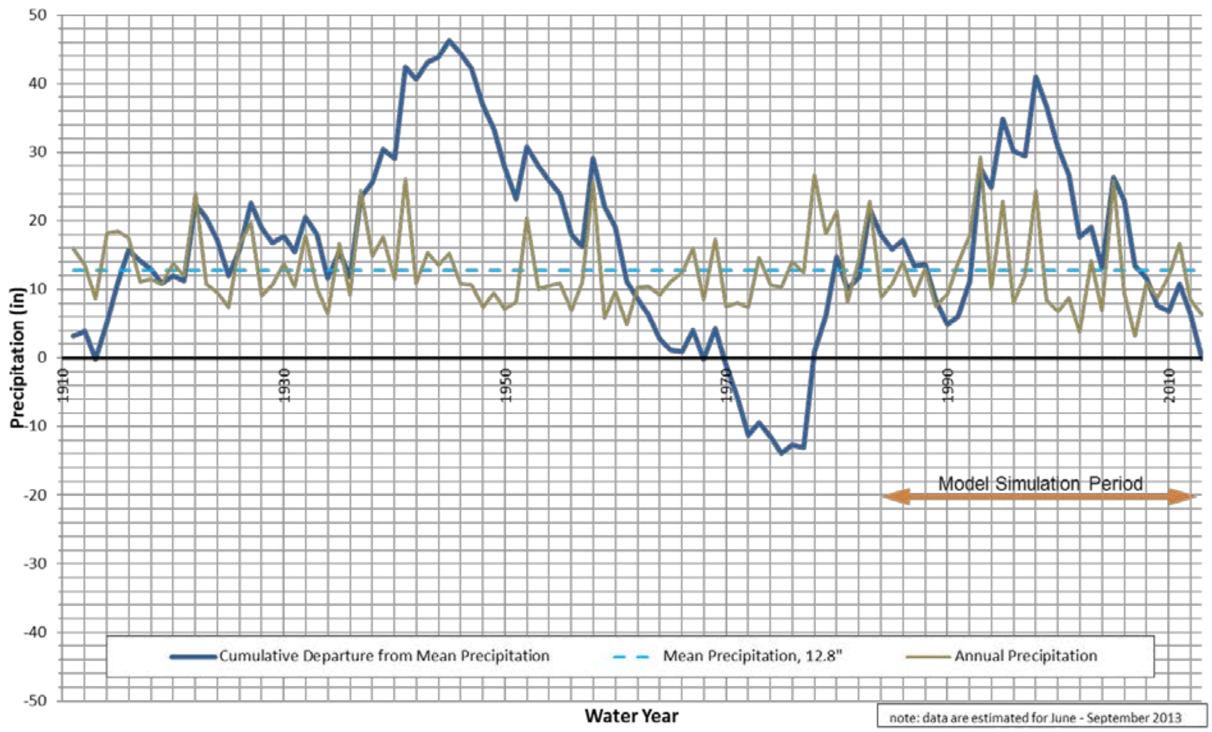


Figure 5: Annual Precipitation and Cumulative Departure from the Mean at Riverside County Flood Control and Water Conservation District, San Jacinto Gauge #186

2.3 San Jacinto Groundwater Basin Geology and Hydrogeology

The conceptual geology of the San Jacinto Groundwater Basin is presented below through description of regional geology, faults, and summary of geologic conditions within each Groundwater Management Zone (GMZ). The conceptual geology provides the foundation for understanding the hydrogeology of the Basin and developing the groundwater model. Basin geology, along with groundwater elevation, groundwater quality, and aquifer property data, allow us to segregate the Basin into hydrogeologic layers and ultimately into model layers for numerical modeling. This information is accompanied by 33 detailed cross sections (presented in Appendix A).

2.3.1 *Regional Geology Setting*

The San Jacinto Groundwater Basin underlies San Jacinto, Perris, Moreno, and Menifee Valleys in western Riverside County. As shown in Figure 2, this basin is bounded by the San Jacinto Mountains on the east, the San Timoteo Badlands on the northeast, the Box Spring Mountains on the north, the Santa Rosa Hills and Bell Mountain on the south, and unnamed hills on the west (DWR, 2006).

The San Jacinto Groundwater Basin is located within the Peninsular Range, a series of northwest-oriented mountain ranges extending from the Baja California peninsula north to the Transverse Ranges, the east-west oriented mountains surrounding the Los Angeles Basin and San Fernando Valley (Harden, 1998). The onshore portion of the Peninsular Ranges are further divided into three fault-bounded blocks, with the San Jacinto Groundwater Basin within the eastern portion of the Perris Block, a roughly rectangular area of relatively low relief underlain by metamorphic rocks intruded by Cretaceous plutons of the Peninsular

Ranges Batholith. The San Jacinto Groundwater Basin borders the San Jacinto Mountains Block on the east (Morton & Miller, 2006).

The San Jacinto Groundwater Basin is bounded by crystalline bedrock or lower permeability sedimentary and metamorphic rocks, with these boundaries often accompanied by faults on the east. The Basin is a closed basin, with no significant groundwater flow into or out of other groundwater basins, however, based on groundwater level readings in the area, a significant amount of groundwater does flow through the subsurface into the Basin from the surrounding hills. The western boundary of the Basin is primarily the Cretaceous Val Verde Tonalite, an intrusive igneous (plutonic) rock, also called quartz diorite[5]. Tonalites are also common along the northern boundary of the Basin, along with other intrusive igneous rocks. The southern and southwestern boundary is a mix of intrusive igneous rocks and metamorphic rocks, such as quartzite, phyllite, schist, and gneiss. Along the eastern boundary, the northern portion is largely the Claremont Fault, with the sandstones and conglomerates of the Pliocene San Timoteo Beds along with Cretaceous granite[6] and Paleozoic metamorphic rocks on the opposite side of the fault. The southern portion of the eastern boundary is located to the east of the Claremont Fault and is generally the contact with the Bautista Formation, a Pleistocene arkosic sandstone with silty and clayey beds. Unlike the igneous and metamorphic rocks bordering the basin in other areas, some groundwater production occurs within the Bautista.

Several hills and mountains are present within the basin. The Bernasconi Hills and Mt. Russell Range (Figure 6), located around Lake Perris, are comprised of Cretaceous granitic rocks, including tonalites. The Lakeview Mountains (Figure 6) are also comprised largely of granitics, including tonalite and granodiorite. Hills and mountains near Menifee are generally comprised of Cretaceous granitics and Triassic metamorphics. Park Hill (Figure 6) is comprised of the sedimentary Bautista Formation (Morton & Miller, 2006; Rogers, 1965).

The primary water-bearing materials in the San Jacinto Groundwater Basin are alluvial materials deposited above crystalline bedrock or above lower permeability sedimentary bedrock. Depth to bedrock in the Basin is shown on Figure 6. The depth to crystalline bedrock in the Upper Pressure ranges from 10,000 feet near Lower Pressure to near ground surface to the south near Bautista Creek (Fett, 1968). As shown in Figure 6, deepest bedrock is found within the San Jacinto Graben (see Section 2.3.3) in the Lower Pressure and Upper Pressure GMZs. The deposition of alluvial materials was driven by topography and climate with high energy environments (fast moving water) depositing coarser materials such as gravels and sands and low-energy environments (slow moving water) depositing finer materials such as silts and clays. The depositional environment depended largely on the location of rivers and streams, which move over time, and tectonic activity resulting in a complex mix of heterogeneous gravels, sands, silts, and clays. Despite this heterogeneity, there are trends with depth and with location. Details on subsurface

[5] Tonalite has a mineral composition of hornblende, oligoclase or andesine, pyroxene, and quartz, with quartz comprising 5 – 20% of the light colored minerals (American Geological Institute, 1984)

[6] Granite is a plutonic rock in which quartz makes up 10 to 50% of the felsic components (light-colored, silica-rich minerals) and the alkali feldspar/total feldspar ratio is 65 to 90%. (American Geological Institute, 1984)

conditions are provided for each Groundwater Management Zone (GMZ) later in this section and are supported by the detailed cross sections.

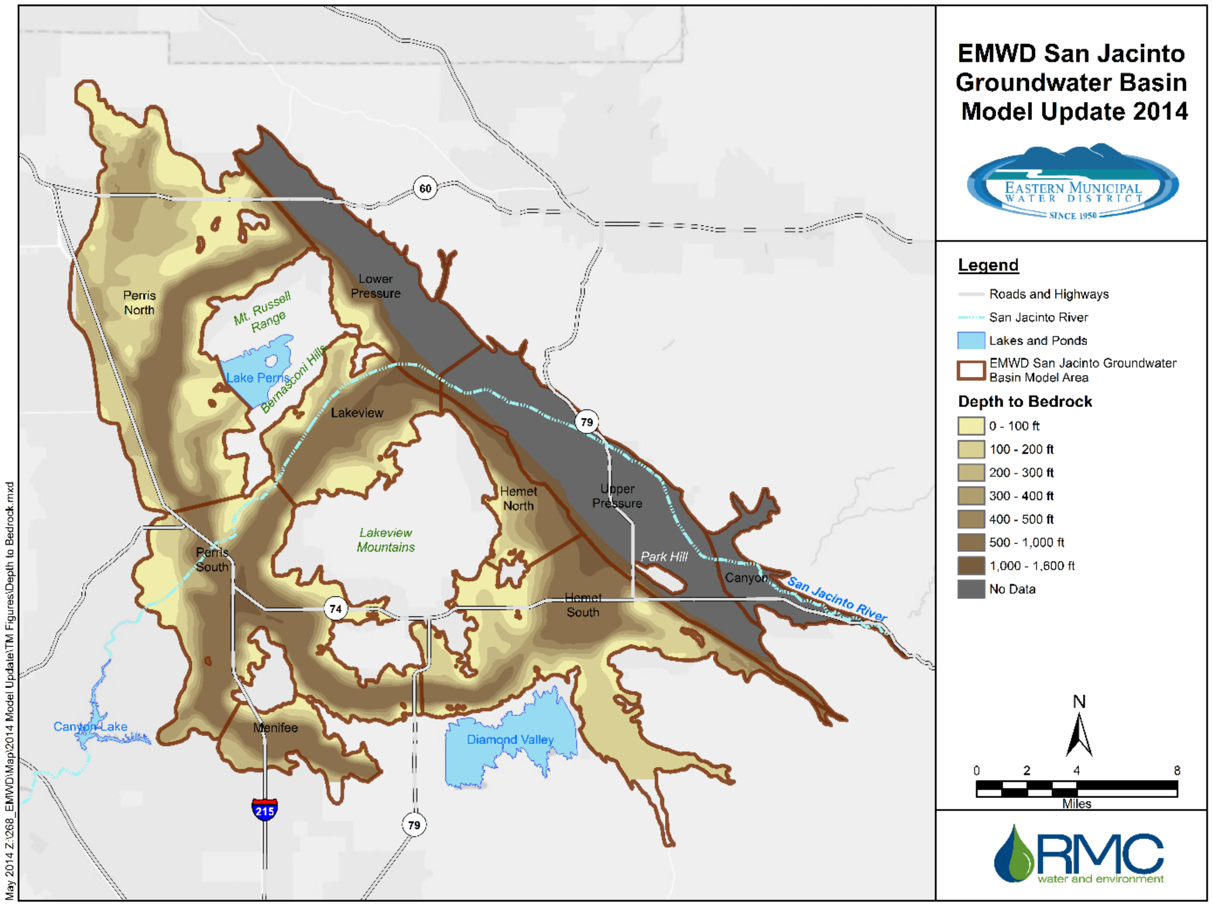


Figure 6: Depth to Bedrock

2.3.2 *Faults*

Faults are an important component of the geology of the San Jacinto Groundwater Basin, forming boundaries, impacting groundwater flow, and causing the uplift and subsidence that led to the current alluvial basin. Major faults in the basin are located in the eastern portion of the area, as shown in Figure 7, and are part of the San Jacinto Fault Zone. Significant faults impacting water-bearing materials include the Claremont Fault, Casa Loma Fault, and Park Hill Fault. The Claremont Fault defines a portion of the eastern boundary of the San Jacinto Basin and also provides a partial barrier to flow between the Canyon and Upper Pressure GMZs with significant groundwater flow across the fault limited to periods when groundwater is within 40 - 60 feet of the ground surface. The Casa Loma Fault impedes movement but still allows groundwater to flow to the northwest of Park Hill based on sampling and analysis of stable isotopes (Williams, Rodoni, & Lee, 1993). The Park Hill Fault also impedes groundwater flow, as seen through water level and water quality differences (Schlehuber, Lee, & Hall, 1989). Other faults and shear zones are present in the basin, but are generally considered to have limited effect on regional groundwater flow.

The area of San Jacinto Lower Pressure and San Jacinto Upper Pressure between the Claremont Fault on the east and the Casa Loma Fault on the west is a structural basin, termed the San Jacinto Graben, formed at a right-step between the Casa Loma and Claremont Faults of the San Jacinto Fault Zone. The area is the site of rapid tectonic subsidence (Morton & Miller, 2006). Such subsidence contributes to depressions such as Mystic Lake that result in accumulation of fine grained materials. Due to ongoing subsidence and sediment deposition over geologic time, extremely thick, fine grained alluvial sediments are present in this area, approximately 10,000 feet thick and estimated to be no older than 1.5 million years old (Fett, 1968; Morton & Miller, 2006).

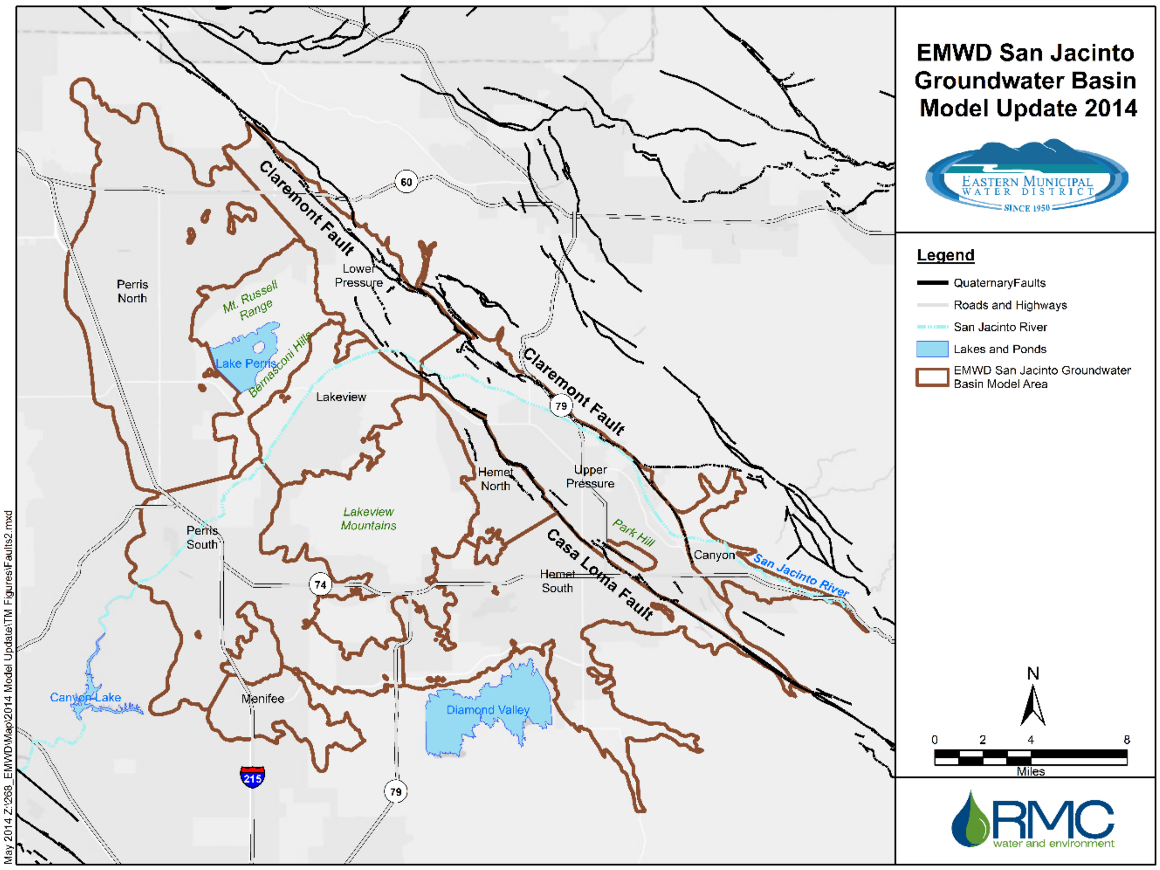


Figure 7: Major Faults in San Jacinto Groundwater Basin

2.3.3 *Local Geology Setting*

Descriptions of the primary water-bearing materials in the San Jacinto Basin are provided below, by groundwater management zone. The descriptions are supported by 33 detailed cross sections developed by EMWD, shown in Appendix A. The cross sections were developed based on lithologic logs, downhole geophysical logs, well construction logs, water quality, water levels, areal geophysics, photographic review, literature review, and field observations. These cross sections span all or a portion of one or more GMZs.

Cross sections with significant relevance to each GMZ are listed within the subsection as either being primarily a longitudinal cross section, a transverse cross section, or some combination of the two.

The descriptions are also supported by a basinwide depth-to-bedrock map (Figure 6), basinwide fault map (Figure 7), basinwide groundwater elevation map (Figure 8), estimates of average ambient water quality within the Management Zones (Figure 9 and Figure 10), characteristics of the wells in the basin (Table 3), and limited aquifer test information. The basinwide depth-to-bedrock map was developed based on updates by EMWD to a study by the University of California, Riverside. Estimates of ambient water quality for each GMZ are from statistical analysis using 20-year averages (1993 – 2012) performed for the RWQCB as part of the agreement to adopt the 2004 Basin Plan Amendment (Santa Ana Watershed Project Authority, 2014). Information from existing wells, including the screened intervals and the driller's estimation of production rates are used to provide information on the location of coarser, higher conductivity materials in the subsurface. Finally, limited aquifer test information was used to further refine the location of higher and lower conductivity materials.

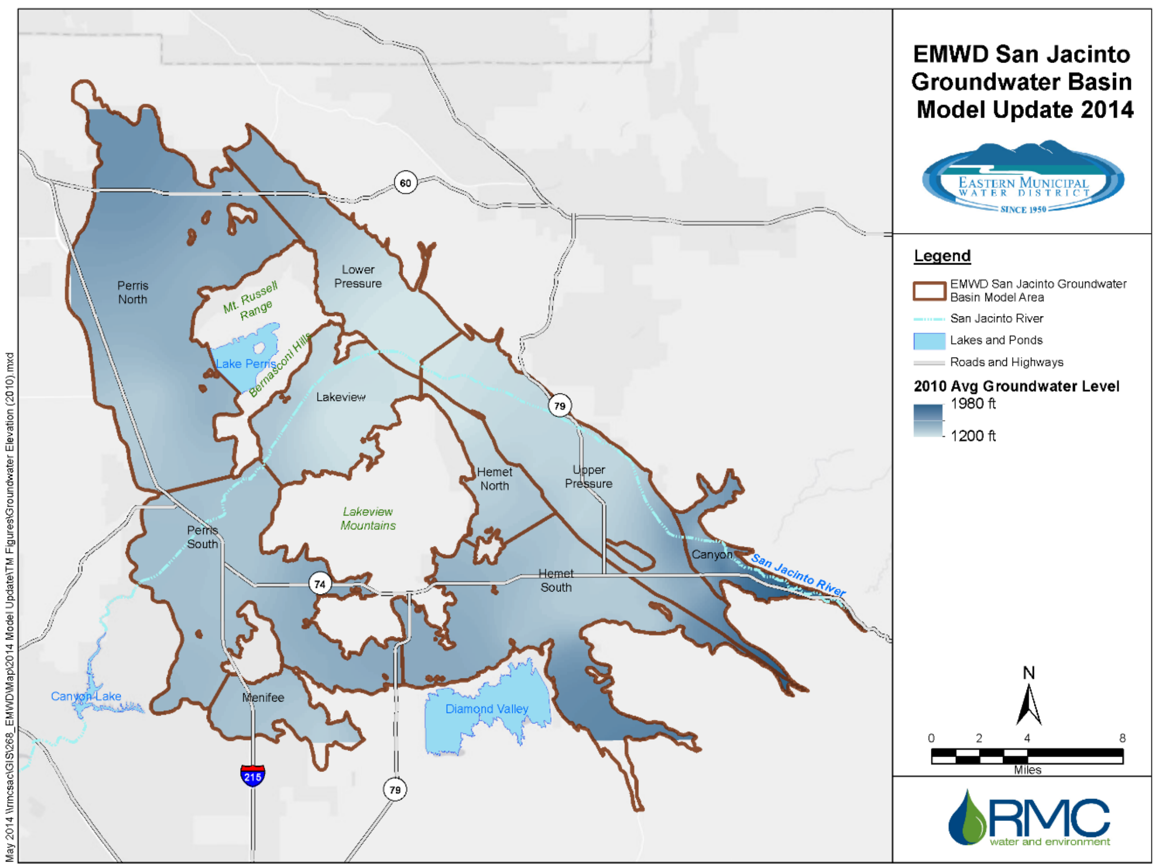


Figure 8: Groundwater Elevation, 2010

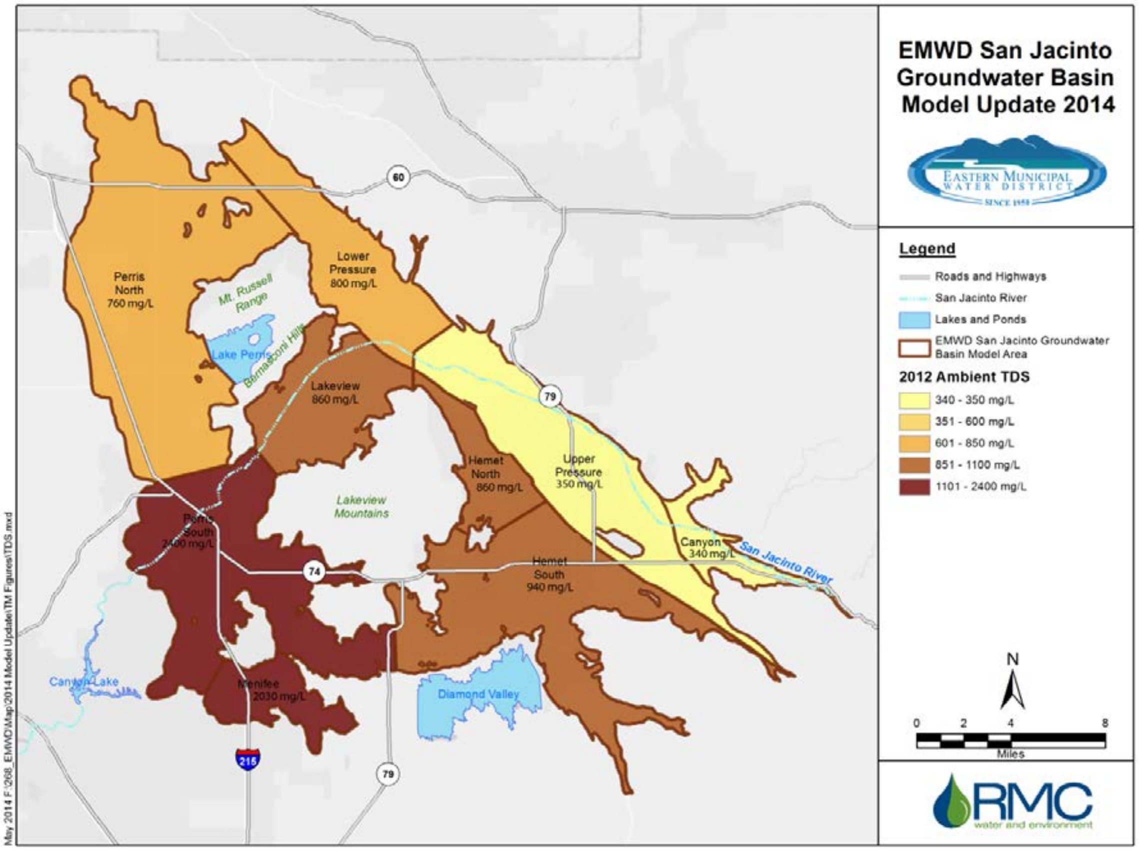
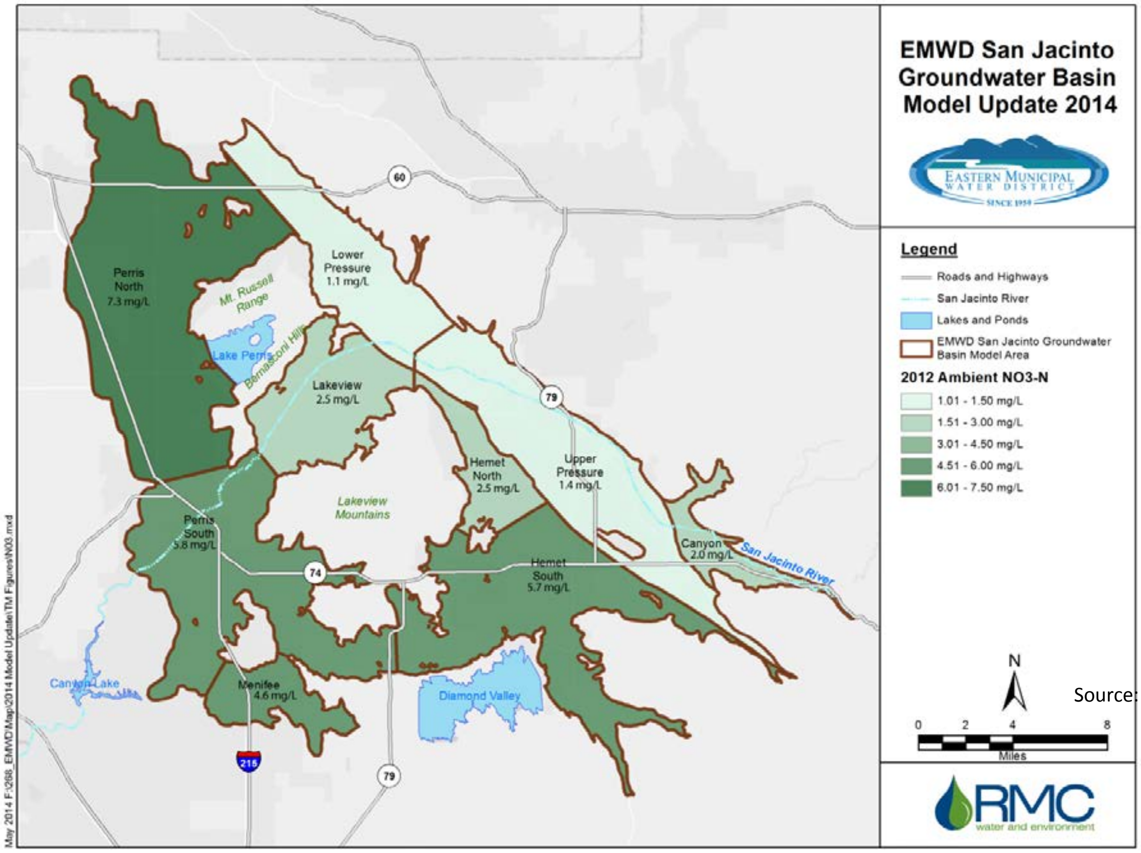


Figure 9: Ambient Average TDS, by Groundwater Management Zone



Source: SAWPA, 2014

Figure 10: Ambient Average Nitrate (as Nitrogen), by Groundwater Management Zone

Table 3: Existing and Historical Well Screen Depths in San Jacinto Groundwater Basin

Depth (ft)	Perris North	Perris South	Menifee	Lower Pressure	Lakeview	Hemet North	Hemet South	Upper Pressure	Canyon
100	50 (33%)	18 (16%)	15 (42%)	2 (5%)	7 (16%)	7 (18%)	43 (38%)	47 (34%)	14 (41%)
200	79 (52%)	52 (47%)	18 (50%)	7 (19%)	23 (53%)	20 (50%)	34 (30%)	58 (41%)	22 (65%)
300	81 (54%)	38 (34%)	14 (39%)	11 (30%)	26 (60%)	26 (65%)	42 (37%)	63 (45%)	18 (53%)
400	49 (32%)	24 (22%)	15 (42%)	18 (49%)	27 (63%)	27 (68%)	37 (33%)	58 (41%)	25 (74%)
500	25 (17%)	16 (14%)	12 (33%)	14 (38%)	21 (49%)	15 (38%)	21 (19%)	55 (39%)	16 (47%)
600	13 (9%)	8 (7%)	3 (8%)	15 (41%)	12 (28%)	7 (18%)	12 (11%)	45 (32%)	12 (35%)
700	9 (6%)	7 (6%)	2 (6%)	16 (43%)	5 (12%)	4 (10%)	6 (5%)	35 (25%)	6 (18%)
800	- (-%)	3 (3%)	- (-%)	10 (27%)	5 (12%)	2 (5%)	4 (4%)	26 (19%)	3 (9%)
900	- (-%)	2 (2%)	- (-%)	8 (22%)	1 (2%)	1 (3%)	1 (1%)	17 (12%)	2 (6%)
1000	- (-%)	1 (1%)	- (-%)	7 (19%)	- (-%)	- (-%)	- (-%)	11 (8%)	3 (9%)
1100	- (-%)	- (-%)	- (-%)	4 (11%)	- (-%)	- (-%)	- (-%)	8 (6%)	2 (6%)
1200	- (-%)	- (-%)	- (-%)	1 (3%)	- (-%)	- (-%)	- (-%)	4 (3%)	- (-%)
1300	- (-%)	- (-%)	- (-%)	1 (3%)	- (-%)	- (-%)	- (-%)	3 (2%)	1 (3%)
1400	- (-%)	- (-%)	- (-%)	- (-%)	- (-%)	- (-%)	- (-%)	3 (2%)	- (-%)
1500	- (-%)	- (-%)	- (-%)	- (-%)	- (-%)	- (-%)	- (-%)	3 (2%)	- (-%)
Number of Wells	151	111	36	37	43	40	113	140	34

2.3.3.1 San Jacinto Upper Pressure GMZ

San Jacinto Upper Pressure GMZ (Upper Pressure) is located in the eastern portion of the Basin, as shown in Figure 11, and includes portions of the City of San Jacinto, City of Hemet, unincorporated urban areas such as East Hemet, agricultural areas, and undeveloped areas. Upper Pressure is located to the northeast of Hemet South GMZ; southwest of the San Jacinto Mountains and Canyon GMZ; northwest of Rouse Hill; and southeast of the Lower Pressure GMZ. The hydrology, geology, and hydrogeology are presented below.

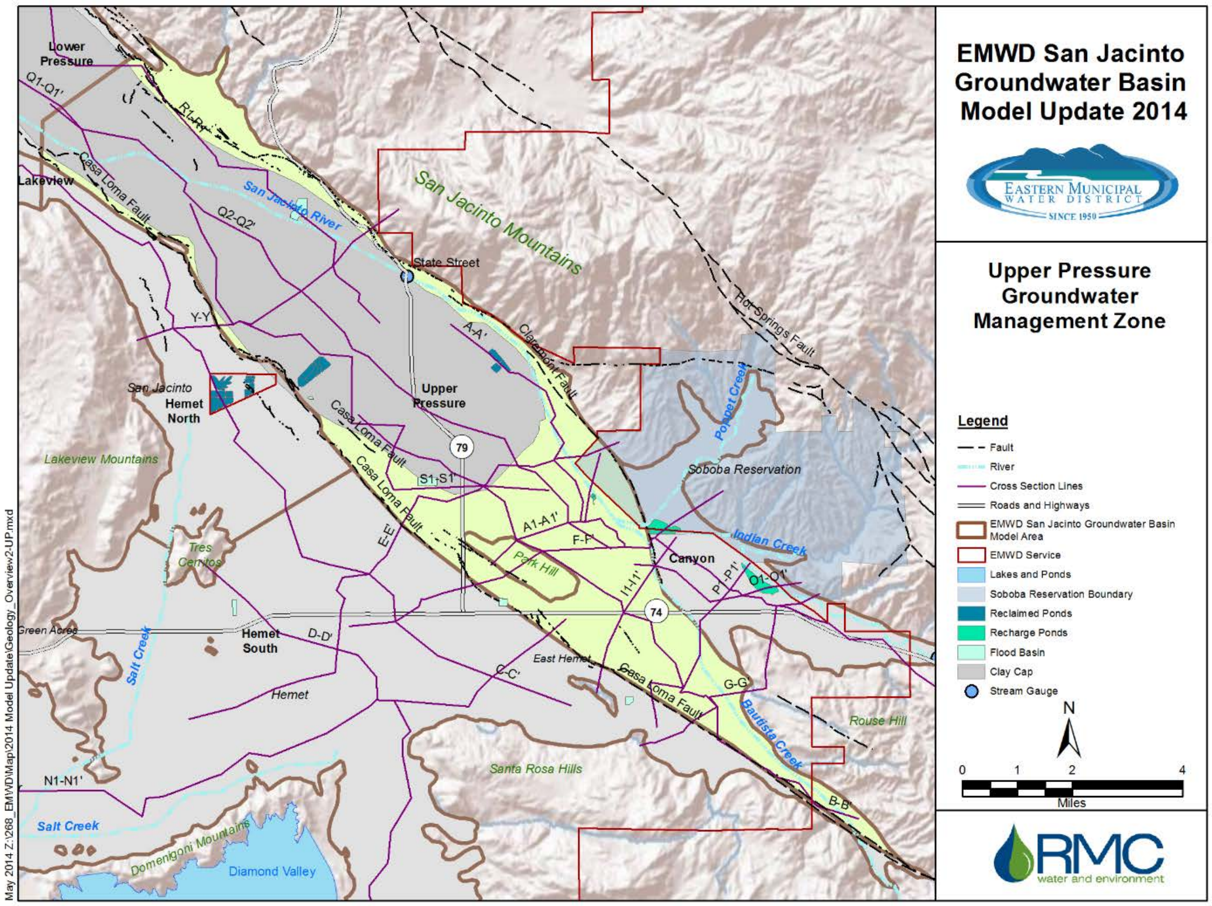


Figure 11: San Jacinto Upper Pressure GMZ

Hydrology

Hydrology in the Upper Pressure is dominated by the upper-middle reach of the intermittent San Jacinto River, which flows into the Upper Pressure from the Canyon GMZ near San Jacinto just downstream (north) of the confluence of Bautista and Poppet Creeks and flows out of the Upper Pressure into the Lower Pressure GMZ at Bridge Street just upstream of Mystic Lake. The path of the river appears controlled by geologic-structure, generally following the Claremont Fault. The streambed elevation of the San Jacinto River drops about 200 feet vertically over approximately 12 miles within the Upper Pressure. During recent large rainfall events the river has flowed into Mystic Lake, located just downstream of Upper Pressure. The lowest elevation in the Upper Pressure is along the border of Lower Pressure.

The San Jacinto River is gauged within the Upper Pressure at State Street (location shown in Figure 11; site shown in Figure 12). Due to high permeability sediments in the riverbed between Canyon GMZ and State Street, detention and infiltration at the upstream Soboba Pit, and regulation of the river by the upstream Lake Hemet, little flow makes it to the gauge except in times of significant rainfall, about every 5 to 10 years. Due to the limited period of record for streamflow measurements at the State Street gauge, streamflows are estimated based on an analysis by the USGS (Guay, 2002), as discussed in Section 2.4.3.

Bautista Creek enters the southern portion of Upper Pressure before joining with the San Jacinto River along the boundary of Upper Pressure and Canyon. The path of the river appears controlled by geologic-structure, generally following the Bautista Fault. The majority of Bautista Creek in Upper Pressure is concrete lined and has very little leakage. Off stream ponds along Bautista Creek are operated by LHMWD and Riverside County Flood Control and Water Conservation District (RCFC&WCD) to provide recharge to the groundwater system. The largest amount of natural recharge from Bautista Creek occurs upstream in a flood plain in the southernmost part of Upper Pressure. Any additional flows continue into the San Jacinto River.

Additional considerations of the hydrology in the Upper Pressure include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Source: USGS, 2016 (http://waterdata.usgs.gov/nwisweb/local/state/ca/text/11070150_ds.jpg)

Figure 12: San Jacinto River above State Street near San Jacinto, CA Gauge (USGS 11070150)

Geology/Hydrogeology

The Upper Pressure GMZ is located within the San Jacinto Graben as defined by Fett (1968). The Graben is a structural basin formed at a right step between the Claremont Fault on the northeast and the Casa Loma Fault Zone on the southwest (Morton and Miller, 2006). The depth to crystalline bedrock in the Lower Pressure is up to 10,000 feet near Lower Pressure (Fett, 1968). The faulting in the area ranges from the mixed strike-slip (horizontal displacement) and dip-slip (vertical displacement) movement of the Claremont Fault to the dip-slip movement of the Casa Loma Fault (DWR, 1959). Synclines and anticlines have been mapped by the USGS (e.g., Morton and Miller, 2006; Morton and Matti, 2001) in the formations to the east of the Claremont Fault, but no attitudes have been provided on the west side of the fault (within the Upper Pressure). The relatively downdropped area between the faults, the San Jacinto Graben, contains deep sedimentary deposits resulting from concurrent tectonic subsidence and deposition of locally re-worked sediments from the Bautista Formation and other nearby formations, along with sediments transported into the area by the San Jacinto River and its tributaries.

Surficial geology within the Upper Pressure is Holocene alluvial wash deposits near current and recent paths of the San Jacinto River and Bautista Creek, Holocene to late Pleistocene alluvial fan deposits in the valley, with coarser materials in the portions of the valley closer to the higher elevation mountains. The Pleistocene Bautista Formation, an arkosic sandstone with silty and clayey beds, bounds the basin in the east and southeast and also forms the isolated Park Hill to the northeast of Hemet while Miocene and Pliocene sandstones and metamorphic rocks potentially of Paleozoic age are present to the northeast opposite the Claremont fault (California Geological Survey, 2012; Morton and Miller, 2006; Morton and Matti, 2001).

Rivers in the Upper Pressure are a primary source of coarse materials in the subsurface. The rivers and creeks appear to have had numerous alignments in the valley. These historical alignments include the San Jacinto River heading more westerly through San Jacinto and Bautista Creek flowing along a more westerly alignment. Soils maps show coarser materials along these likely historical alignments of the San Jacinto River, as well as Bautista Creek. Historical alignments are supported by boundaries, trails, and road alignments which tended to follow naturally occurring geomorphic features, such as river courses. The surface water courses all display a northwest-southeast trend parallel to the Casa Loma and Claremont Faults. Merging this information with historical and current alignments of the San Jacinto River and Bautista Creek, it appears faulting in the area controls the course of the River, suggesting that similar northwest-southeast trending coarser deposits may exist at depth.

A series of 33 cross-sections were generated based on lithologic logs, downhole geophysical logs, well construction logs, water quality, water levels, areal geophysics, photographic review, literature review, and field observations. The focus of this report is on economically viable groundwater resources which have historically been identified to depths on the order of less than 1,500 feet below ground surface (ft bgs). Subsurface materials in the Upper Pressure are shown through all or portions of the following cross sections (Appendix A).

- Longitudinal cross sections A – A’, B – B’, Q1- Q1’, Q2 – Q2’, R1 - R1’, S1 - S1’,
- Transverse cross sections: A1 – A1’, E – E’, F – F’, G – G’, I1 – I1’, P1 – P1’, Y – Y’

The cross sections show water-bearing materials within the Upper Pressure that include interbedded and intermixed, unconsolidated to consolidated, sand, gravel, cobbles, silt, clay, and boulders. The southern portion of the Upper Pressure is locally known as the Intake with coarse-grained materials extending to the surface allowing for direct recharge of the aquifers below. The upper 200 feet is predominantly clay in the northern area of the Upper Pressure. This northern area is covered by a “clay cap,” an area of clay soils that extends into the southern portion of San Jacinto Lower Pressure, as shown in Figure 13. The portion of the San Jacinto Upper Pressure overlain by the clay cap historically had flowing artesian conditions. The clay soils and subsurface materials here are likely results of lower energy depositional environments, due to tectonic subsidence within the San Jacinto Graben and resulting low gradients for surface water courses.

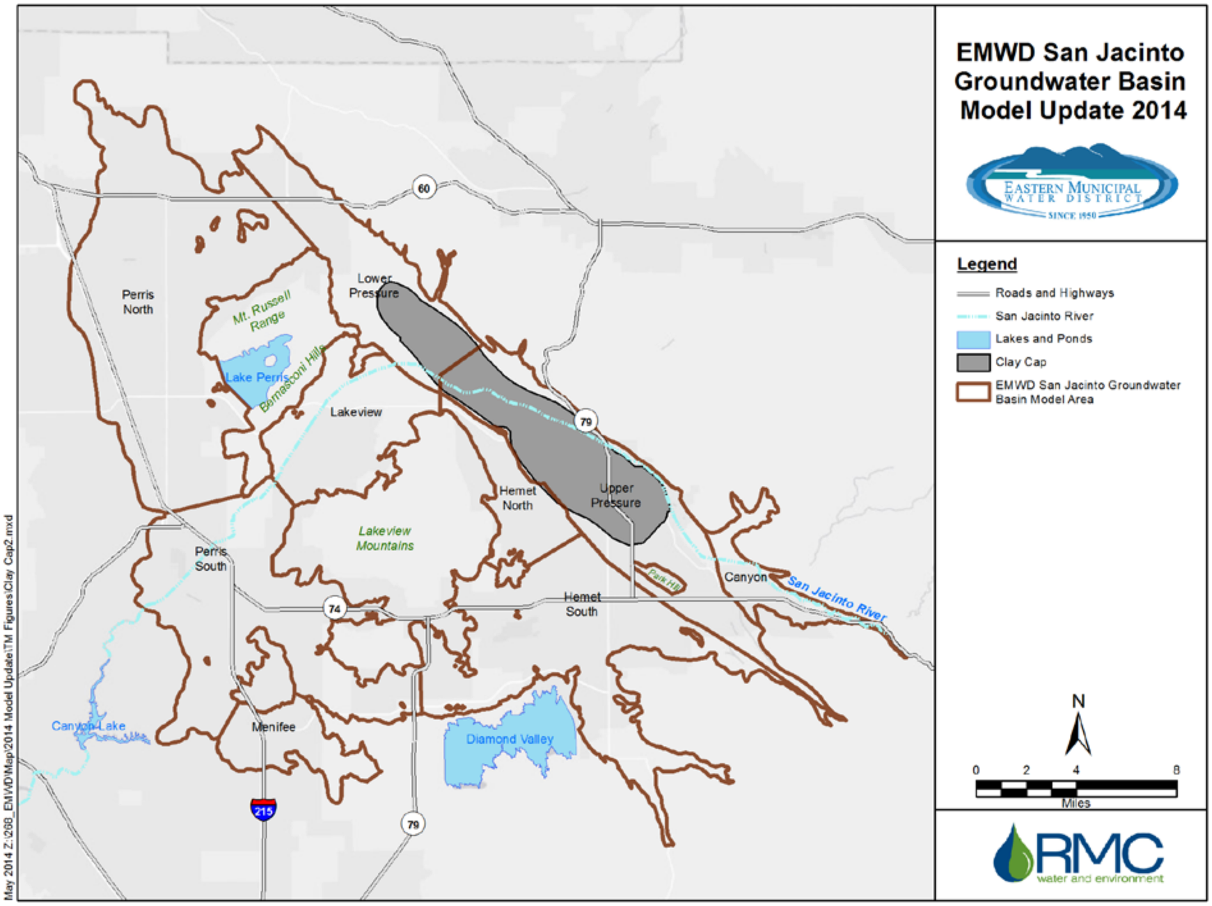


Figure 13: Location of Clay Cap

Park Hill is a prominent feature within the Upper Pressure and is predominantly Bautista Formation, a Pleistocene arkosic sandstone with silty and clayey beds that generally yields significantly less water than the surrounding alluvial materials.

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 800 ft bgs, with wells as deep as nearly 1,500 ft bgs; these data include domestic, irrigation, and municipal wells.

Groundwater production, based on available well test data provided at the time of drilling, has a median value of approximately 700 gpm, with a 25th percentile value of 200 gpm and a 75th percentile value of 1,700 gpm. The maximum yield is 3,800 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well.

Approximately 40% of the groundwater produced within the San Jacinto Groundwater Basin is produced from the Upper Pressure, making it the most productive of the GMZs. Groundwater levels have declined significantly over the past 10 – 20 years with 200 – 300 feet of decline in static water levels observed in select wells.

Previous work in the area estimated aquifer hydraulic conductivities to range between 4 and 42 feet per day (ft/day; TechLink 2002). This range is commonly used for Upper Pressure analyses and is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within the Upper Pressure was estimated by the Santa Ana Watershed Project Authority (SAWPA), with a Nitrate-Nitrogen concentration of 1.4 milligrams per liter (mg/l) and a TDS concentration of 350 mg/l (SAWPA, 2014).

2.3.3.2 San Jacinto Lower Pressure GMZ

San Jacinto Lower Pressure GMZ (Lower Pressure) is located in the northeastern portion of the Basin, as shown in Figure 14, and includes largely undeveloped and agricultural areas with some urban development east of Moreno Valley. Lower Pressure is located to the northeast of Perris North GMZ, Mount Russell, and Lakeview GMZ, and Perris North GMZ. It is southwest of the San Jacinto Mountains, northwest of Upper Pressure and southeast of the Kalmia Hills. The hydrology, geology, and hydrogeology are presented below.

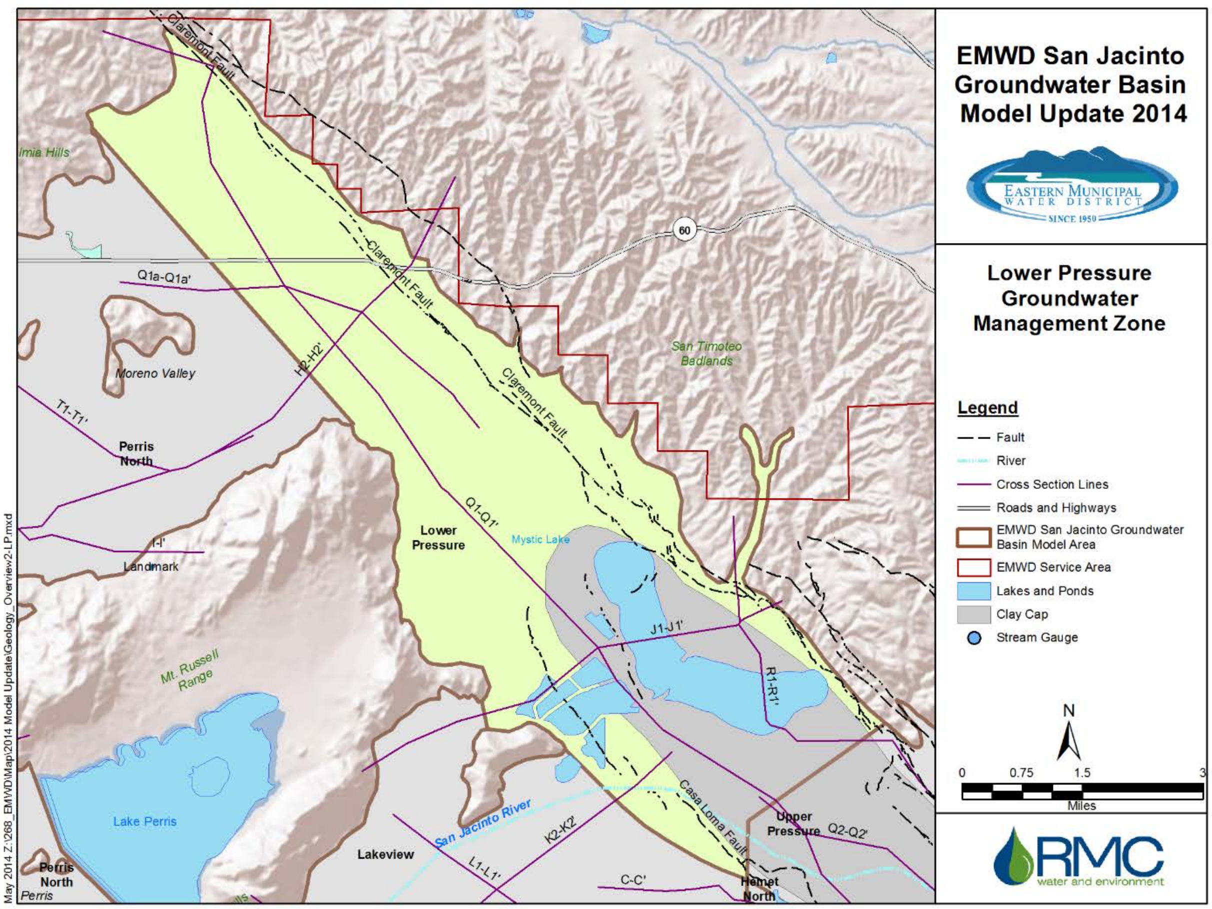


Figure 14: San Jacinto Lower Pressure GMZ

Hydrology

Hydrology in the Lower Pressure is dominated by a reach of the intermittent San Jacinto River, which flows into the GMZ from the Upper Pressure at Bridge Street just upstream of Mystic Lake. Only in very wet years does Mystic Lake overflow, allowing the San Jacinto River continue to flow from Mystic Lake to the southwest towards Canyon Lake. The path of the river upstream of Mystic Lake appears controlled by geologic-structure, generally following faults before flowing southwest from Mystic Lake. The streambed elevation of the San Jacinto River is nearly level within the Lower Pressure, at approximately 1,430 feet above mean sea level. During recent large rainfall events the river has successfully flowed into and terminated at Mystic Lake. The depth and extent of Mystic Lake is increasing over time due to tectonic subsidence, requiring increasingly large rain events to cause overflow (Western Riverside County Agriculture Coalition. 2015).

The San Jacinto River is not gauged within the Lower Pressure, with the closest gauge upstream at State Street within the Upper Pressure. Due to high permeability sediments in the riverbed upstream of the Lower Pressure, detention and infiltration at the upstream Soboba Pit, and regulation of the river by the upstream Lake Hemet, little flow makes it to the Lower Pressure except in times of significant rainfall, about every 5 - 10 years.

Additional considerations of the hydrology in the Lower Pressure include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Geology/Hydrogeology

Similar to the Upper Pressure, the Lower Pressure GMZ is located within the San Jacinto Graben as defined by Fett (1968). The Graben is a structural basin formed at a right step between the Claremont Fault on the northeast and the Casa Loma Fault Zone on the southwest (Morton and Miller, 2006). The depth to crystalline bedrock in the Lower Pressure is up to 10,000 feet near Upper Pressure (Fett, 1968). The faulting in the area ranges from the mixed strike-slip (horizontal displacement) and dip-slip (vertical displacement) movement of the Claremont Fault to the dip-slip movement of the Casa Loma Fault (DWR, 1959). Fissures are present in the vicinity of Mystic Lake due to a combination of tectonic movement and subsidence due to groundwater withdrawal (Morton and Matti, 2001). Synclines and anticlines have been mapped by the USGS in the formations to the east of the Claremont Fault (e.g., Matti and Morton, 2010; Morton and Miller, 2006; Morton and Matti, 2001). This includes the San Timoteo Anticline in the San Timoteo Badlands, which includes deformed Miocene to Pleistocene age sedimentary materials. No attitudes have been provided on the west side of the fault (within the Lower Pressure). The relatively downdropped area between the faults, the San Jacinto Graben, contains deep sedimentary deposits resulting from concurrent tectonic subsidence and deposition of locally re-worked sediments from the Bautista Formation and other nearby formations, along with sediments transported into the area by the San Jacinto River and its tributaries.

Surficial geology within the Lower Pressure is generally Quaternary alluvial fan deposits in the valley, with mixed lacustrine and fluvial deposits in the Mystic Lake area. The Lower Pressure is bounded on the northeast by nonmarine sedimentary rocks, including the Pleistocene and Pliocene San Timoteo formation and the Miocene Mt. Eden formation, and by Cretaceous granitic rocks and tonalite. To the north, Cretaceous granitic rocks and tonalite bound the basin, and Tonalite is also present in the Cretaceous granitic rocks that make up the Bernasconi Hills to the west (Morton and Miller, 2006; Morton and Matti, 2001; Matti and Morton, 2010).

Major surface water features are the San Jacinto River and Mystic Lake. Due to the flat topography, the low energy depositional environment results in finer grained materials deposited in Lower Pressure, compared to the higher energy environments in the Upper Pressure and Canyon.

A series of 33 cross-sections were generated based on lithologic logs, downhole geophysical logs, well construction logs, water quality, water levels, areal geophysics, photographic review, literature review, and field observations. The focus of this report is on economically viable groundwater resources which have historically been identified to depths on the order of less than 1,500 ft bgs. Subsurface materials in the Lower Pressure are shown through all or portions of the following cross sections.

- Longitudinal cross sections, Q1,- Q1’, Q1a – Q1a’, R1 – R1’S1, S1’,
- Transverse cross sections: J1 – J1’

The cross sections show water-bearing materials within the Lower Pressure that include interbedded and intermixed, unconsolidated to consolidated, sand, gravel, cobbles, silt, clay, and boulders. Compared to the Upper Pressure, the Lower Pressure has significantly finer grained subsurface materials, with mostly clays in the subsurface. The bulk of the southern portion of the Lower Pressure is covered by the “clay cap,” an area of clay soils that extends into the northern and central portions of the Upper Pressure as shown in Figure 13. This area historically had artesian conditions and pockets of natural gas (Waring, 1919). The clay soils and subsurface materials here are results of lower energy depositional environments as the San Jacinto River flows at lower flow rates as it moves north through this area, particularly at Mystic Lake, an inward draining depression that continues to subside largely due to tectonic activity.

As shown in Table 3, existing and historical groundwater wells are typically screened between 300 and 900 ft bgs, with wells as deep as 1,300 ft bgs.

Groundwater production, based on available well test data provided at the time of drilling, has a median value of approximately 500 gpm, with a 25th percentile value of 200 gpm and a 75th percentile value of 1,600 gpm. The maximum yield is 3,000 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well. Less than 1% of the groundwater produced within the San Jacinto Groundwater Basin is produced from the Lower Pressure, making it the least productive of the GMZs.

Previous work in the area estimated aquifer hydraulic conductivities to be less than 14 feet/day, except for higher conductivity near Lakeview (TechLink 2002). No detailed aquifer test data are available for the Lower Pressure. This range is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within the Lower Pressure was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 1.1 mg/l and a TDS concentration of 800 mg/l (SAWPA, 2014).

2.3.3.3 Lakeview and Hemet North GMZs

Lakeview and Hemet North GMZs are located in the central portion of the Basin, as shown in Figure 15 and Figure 16, respectively. The GMZs include agricultural areas; undeveloped areas; portions of the Cities of San Jacinto and Hemet; and unincorporated Lakeview and Nuevo. The two GMZs are located between the Lakeview Mountains and both the Bernasconi Hills and Upper Pressure. The hydrology, geology, and hydrogeology are presented below.

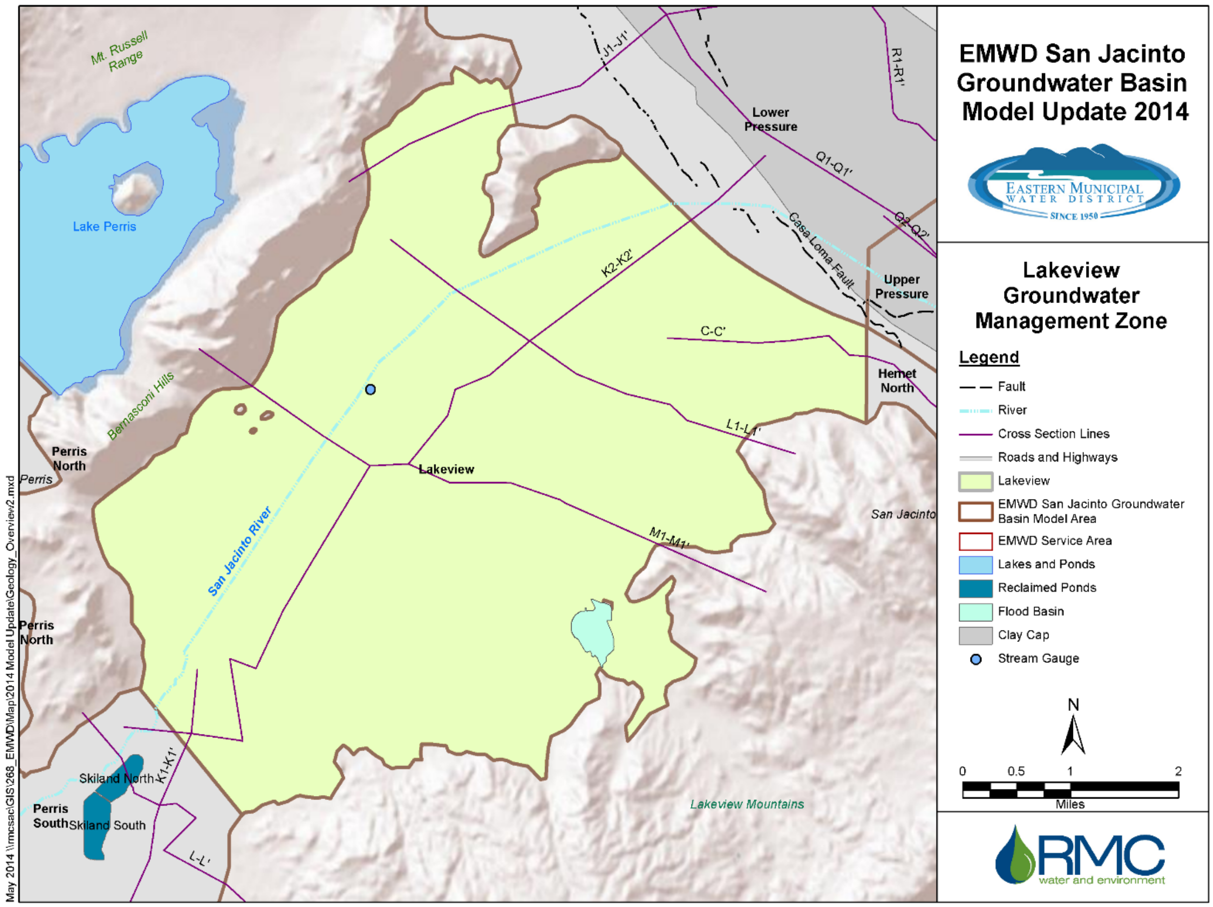


Figure 15: Lakeview GMZ

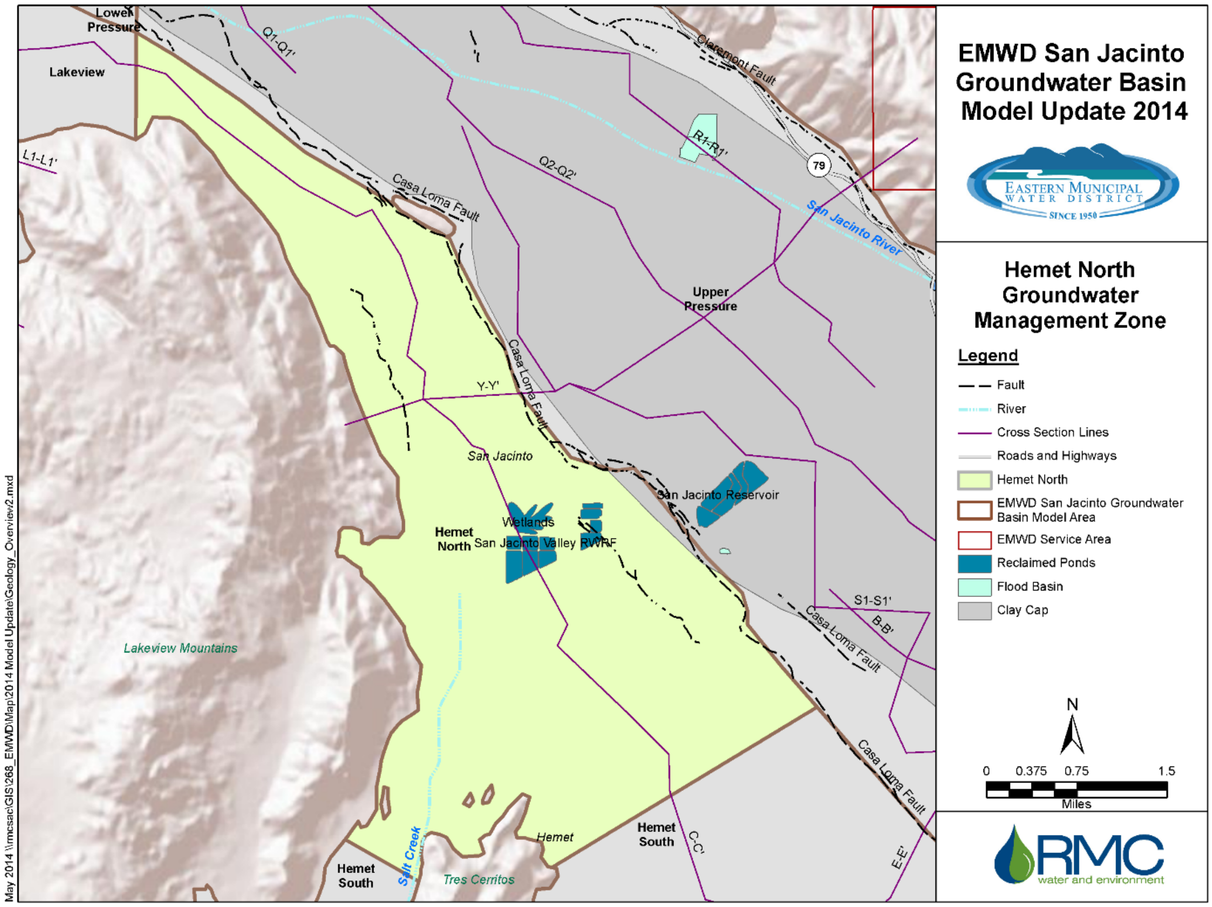


Figure 16: Hemet North GMZ

Hydrology

Hydrology in the Lakeview and Hemet North GMZs include a reach of the intermittent San Jacinto River, which flows into the GMZ only on overflow of Mystic Lake in the Upper Pressure. Only in very wet years does Mystic Lake overflow, allowing the San Jacinto River continue to flow from Mystic Lake to the southwest towards Canyon Lake. The streambed elevation of the San Jacinto River is nearly level within Lakeview, dropping approximately 10 feet.

The San Jacinto River is gauged at the San Jacinto River at Ramona Expressway near Lakeview, CA gauge (USGS 11070210; location shown on Figure 15; site shown on Figure 17). As previously discussed, significant flow only occurs with overflow of Mystic Lake, which occurs only about every 10 years.

Additional considerations of the hydrology in the Lakeview and Hemet North GMZs include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Source: USGS, 2016 (http://waterdata.usgs.gov/nwisweb/local/state/ca/text/11070210_us.jpg)

Figure 17: **San Jacinto River at Ramona Expressway near Lakeview, CA gauge (USGS 11070210)**

Geology/Hydrogeology

The Lakeview and Hemet North GMZs are bordered by the Casa Loma Fault Zone on the northeast, by the Lakeview Mountains, and by neighboring GMZs, Hemet South and Perris South. Lakeview and Hemet North are located to the southeast of the San Jacinto Graben, and thus does not have the very deep bedrock conditions of Upper Pressure and Lower Pressure. The depth to bedrock in the Lakeview and Hemet North, illustrated in Figure 6, is approximately 1,000 feet in the eastern portion of the GMZs, closest to the Upper Pressure. Depth to bedrock decreases somewhat uniformly towards the Lakeview Mountains and Tres Cerritos to the west. The depth to bedrock in the Lakeview GMZ is deepest along the central part of the valley, up to approximately 900 to 1,000 feet. Depth to bedrock decreases somewhat uniformly towards the Lakeview Mountains to the south and Bernasconi Hills to the north.

Surficial geology within Lakeview and Hemet North is generally Quaternary alluvial fan deposits, with younger deposits near the San Jacinto River and active alluvial fans. The Lakeview Mountains are composed primarily of the tonalite of the Cretaceous Lakeview Mountains pluton. Tonalite is also present in the Cretaceous granitic rocks that make up the Bernasconi Hills. (Morton and Miller, 2006).

The most significant surface water features in Lakeview and Hemet North are the San Jacinto River and Salt Creek, respectively. Due to the flat topography, the low energy depositional environment results in finer grained materials deposited by the San Jacinto River in Lakeview, compared to the higher energy environments in the Upper Pressure and Canyon.

A series of 33 cross-sections were generated based on lithologic logs, downhole geophysical logs, well construction logs, water quality, water levels, areal geophysics, photographic review, literature review, and field observations. Subsurface materials In Lakeview and Hemet North are shown through all or portions of the following cross sections.

- Longitudinal cross sections K2 – K2’, C – C’,
- Transverse cross sections: M1 – M1’, L1 – L1’, Y – Y’

The cross sections show water-bearing materials within Lakeview and Hemet North that include interbedded and intermixed, unconsolidated to consolidated, sand, gravel, cobbles, silt, clay, and boulders. The cross sections show a heterogeneity of sediments, as well as significant variability in water quality both spatially and with depth. TDS concentrations at specific depth intervals can vary by an order of magnitude at a single location.

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 600 ft bgs, with wells as deep as approximately 900 ft bgs.

Groundwater production for Hemet North, based on available well test data provided at the time of drilling, has a median value of approximately 500 gpm, with a 25th percentile value of 300 gpm and a 75th percentile value of 1,200 gpm. The maximum yield indicated by the existing well data is 2,100 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well.

Groundwater production for existing wells in Lakeview, based on available well test data provided at the time of drilling, has a median value of approximately 1,300 gpm, with a 25th percentile value of 500 gpm and a 75th percentile value of 2,000 gpm. The maximum yield indicated by the existing well data is 3,000 gpm. Again, note that well performance is a function of aquifer materials, well construction, and the intended use of the well. Approximately 8% of the groundwater produced within the San Jacinto Groundwater Basin is produced from Lakeview and Hemet North combined.

Previous work in the area estimated aquifer hydraulic conductivities to range from less than 5 to 30 feet/day, with the highest conductivities in the unconsolidated materials and lowest conductivities in consolidated, silty fine sand deposits (TechLink 2002). No detailed aquifer test data are available for Lakeview or Hemet North. This range is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within the Lakeview and Hemet North GMZs was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 2.5 mg/l and a TDS concentration of 860 mg/l (SAWPA, 2014). Higher TDS concentrations are present in the western portion of the Lakeview and are associated with groundwater underflow from Perris South.

2.3.3.4 Perris North GMZ

Perris North GMZ is located in the northwestern portion of the Basin, as shown in Figure 18, and includes urban areas such as the City of Moreno Valley, portions of the City of Perris, and March Air Reserve Base, as well as undeveloped areas. Perris North is between the Bernasconi Hills and smaller hills to the west, south of the Box Springs Mountains, and north of the Perris South GMZ. The hydrology, geology, and hydrogeology are presented below.

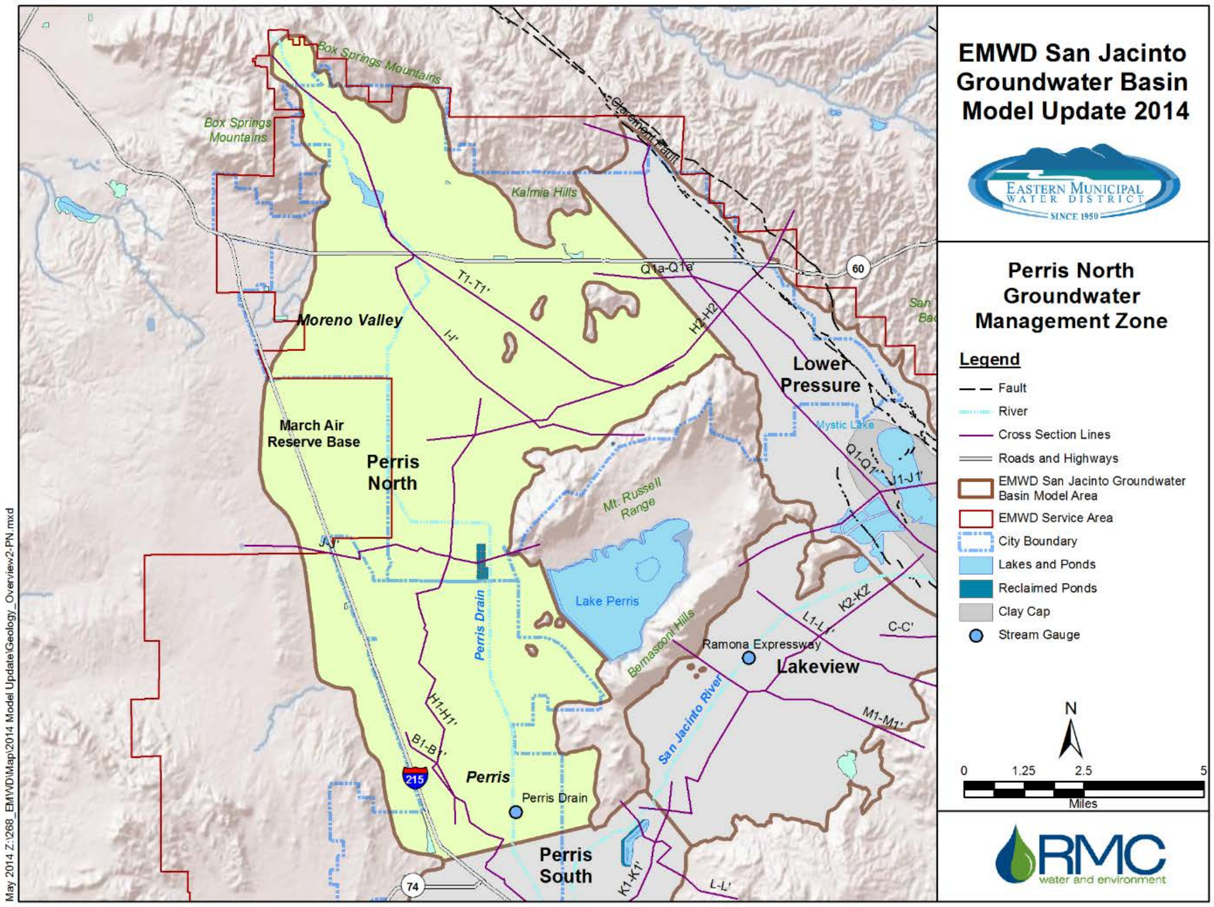


Figure 18: Perris North GMZ

Hydrology

Hydrology within Perris North includes an extensive drainage network built and maintained by the RCFC&WCD. The Perris Valley Storm Drain (Perris Drain) is a major feature of this drainage system, running from MARB south to Perris South before discharging into the San Jacinto River. It drains an approximately 38 square-mile area which includes the City of Perris, City of Moreno Valley, and the March Air Reserve Base (MARB). Generally, the Perris Drain is an earthen channel, except for a portion north of MARB where it is concrete lined. There is one gauge along the Perris Drain: Perris Valley Storm Drain at Nuevo Road near Perris, CA (USGS 11070270); the gauge's location is shown in Figure 18 and a photograph of the site is shown in Figure 19.

Other hydrologic features in and near Perris North include Lake Perris and recycled water storage ponds. Lake Perris is a terminal reservoir of the State Water Project located immediately to the east of Perris North. With a surface elevation higher than the neighboring GMZ, Lake Perris contributes to the Perris North groundwater system through underflow estimated to be 3,786 AFY, where 585 AFY was due to underflow under the west abutment and 3,201 AFY was due to underflow of the subterranean stream beneath the east abutment. A significantly smaller feature, the Moreno Valley Regional Water Reclamation Facility (RWRF) utilizes wet weather recycled water storage ponds to balance supply and demand at the Moreno Valley Regional Water Reclamation Facility (RWRF). The ponds, located as shown in Figure 18, can store up to 260 million gallons (EMWD, 2006).

Additional considerations of the hydrology in the Perris North include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Source: USGS, 2016 (http://waterdata.usgs.gov/nwisweb/local/state/ca/text/11070270_lf.jpg)

Figure 19: Perris Valley Storm Drain at Nuevo Road near Perris, CA (USGS 11070270)

Geology/Hydrogeology

The depth to bedrock in the Perris North GMZ is up to 800 feet, with the deepest portions of the basin along the central portion of the GMZ, running along the north and west sides of the Mt. Russell Range (Figure 6). Shallower bedrock conditions are present to the north of this trough within 200 feet of the ground surface.. Very shallow groundwater conditions exist in the basin, particularly near MARB where groundwater levels are within 15 feet of the surface. Depth to groundwater increases towards the northern portion of the GMZ, near the 60 Freeway, with depths up to 85 feet.

The Perris North is bounded by Cretaceous Val Verde tonalite to the west and by Cretaceous tonalite and granodiorite to the north. The Mt. Russell Range to the south is composed of Cretaceous tonalite and granitic rocks. Tonalite is also present in the Cretaceous granitic rocks that make up the Bernasconi Hills. (Morton and Miller, 2006).

Surficial geology within Perris North is generally Quaternary alluvial fan deposits, typically older than the alluvial fan deposits of Canyon, Upper Pressure, Lower Pressure, Lakeview, and Hemet North. Younger deposits are present along the north-south axis of Perris Valley west of Perris Reservoir, roughly along the alignment of Perris Drain from the Moreno Valley RWRF south to Perris South, and around the northwest flank of the Mt. Russell Range.

Subsurface materials in Perris North fill a bedrock trough and include interbedded and mixed sand, gravel, silt, and clay. More extensive fine grained sediments occur near the boundary with Lower Pressure. Subsurface conditions are shown through all or portions of the following cross sections:

- Longitudinal cross sections T1 – T1’, H2 – H2’, H1 – H1’
- Transverse cross sections: J – J’
- Mixed longitudinal and transverse cross sections: I – I’

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 500 feet bgs, with wells as deep as nearly 700 feet bgs.

Groundwater production, based on available well test data provided at the time of drilling, has a median value of approximately 100 gpm, with a 25th percentile value of less than 100 gpm and a 75th percentile value of 800 gpm. The maximum yield is 2,600 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well.

Approximately 10% of the overall groundwater produced within the San Jacinto Groundwater Basin is produced from Perris North. Groundwater levels are generally increasing at a rate of up to 3 feet per year.

Previous work in the area estimated aquifer hydraulic conductivities to range from less than 1 to about 10 to 15 feet/day (TechLink 2002). No detailed aquifer test data are available for Perris North. This range is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within the Perris North was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 7.3 mg/l and a TDS concentration of 760 mg/l. TDS concentrations have increased over time, with an average from 1954-1973 of 568 mg/l (SAWPA, 2014).

2.3.3.5 Perris South GMZ

Perris South GMZ is located in the southwestern portion of the Basin, as shown in Figure 20, and includes urban areas such as portions of the Cities of Perris and Menifee and unincorporated areas of Romoland, Homeland, and Winchester. Perris North also contains agricultural and undeveloped areas. Perris South is west of the Lakeview Mountains and Hemet South GMZ; east of smaller unnamed hills; south of Perris North GMZ; and north of the Menifee GMZ. The hydrology, geology, and hydrogeology are presented below.

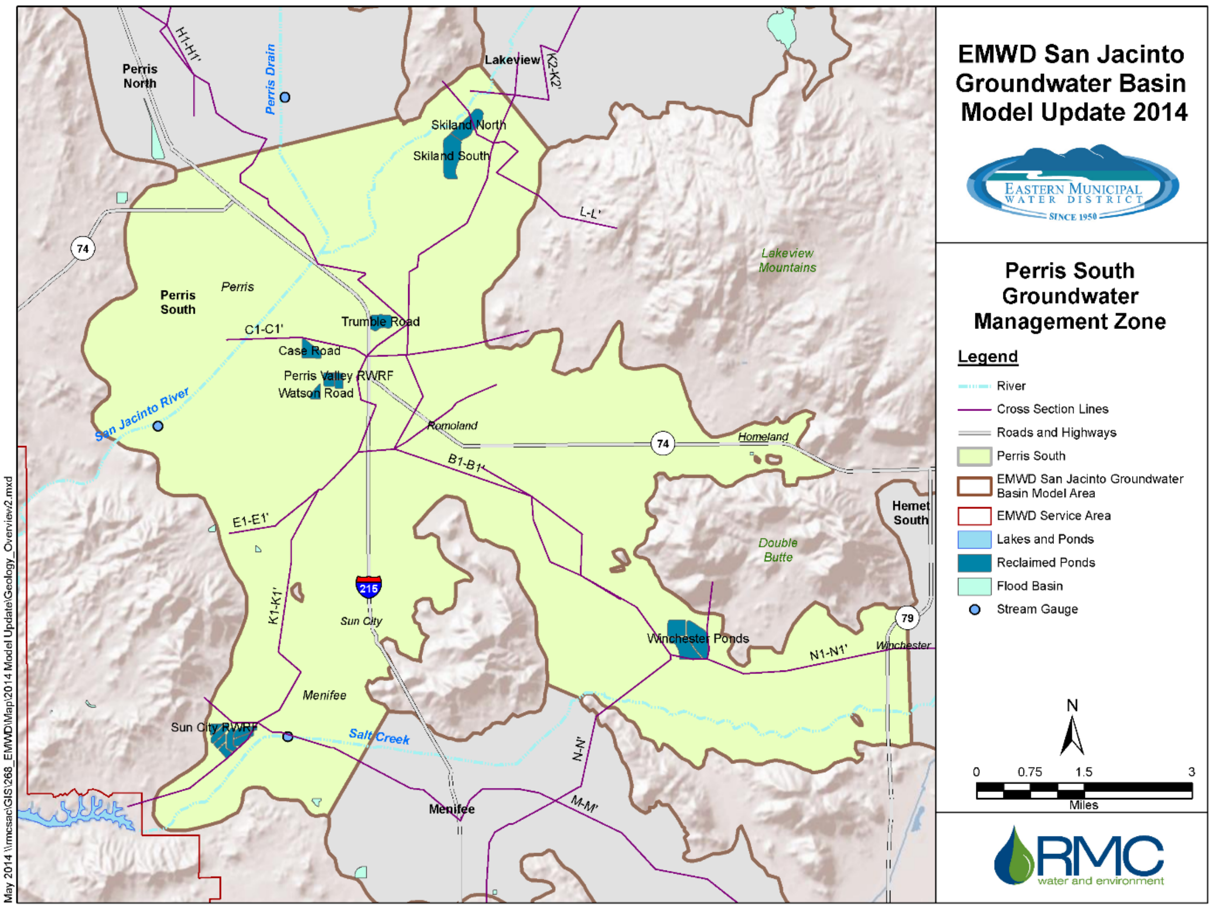


Figure 20: Perris South GMZ

Hydrology

Hydrology within Perris South includes the San Jacinto River and an extensive drainage network built and maintained by the RCFC&WCD. The Perris Drain enters the basin from Perris North and flows into the intermittent San Jacinto River, which, as discussed in the Lakeview and Hemet North Section, has little natural flow except during very wet weather occurring approximately once every 10 years.

Other hydrologic features in Perris South include recycled water storage ponds and the intermittent Salt Creek. Recycled water storage ponds include the Winchester Ponds, which store 550 million gallons of recycled water during periods of low demand (EMWD, 2014). Salt Creek, while rarely having flow, enters Perris South from Hemet South, passes through Menifee, and leaves the Basin to drain into Canyon Lake to the west. There is one gauge on Salt Creek: Salt Creek at Murrieta Road near Sun City, CA (USGS 11070465), with the location shown on Figure 20.

Additional considerations of the hydrology in the Perris South include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Geology/Hydrogeology

The Perris South GMZ is a brackish groundwater basin with a depth to bedrock of up to 1,200 feet. The brackish nature of the groundwater is believed to be caused by historical land uses in the area. The deepest portions of the basin are in the central portion of the GMZ, between Romoland and the 215 Freeway. Areas with depths between 700 and 1,100 feet run along the axes of the valleys, from the Perris North boundary to the Hemet South boundary and from the Lakeview boundary to the Menifee boundary. The depth to bedrock is illustrated in Figure 6.

The Perris South is bounded by Triassic quartzite and quartz-rich metasandstone, Triassic phyllite, and Cretaceous gabbro to the west. The unnamed hill to the east of Sun City on the southern edge of Perris South has similar composition. The Lakeview Mountains are composed primarily of tonalite of the Cretaceous Lakeview Mountains pluton; Double Butte is composed of Cretaceous granodiorite, Cretaceous tonalite, and Triassic metamorphic rocks; and the hills south of Winchester are comprised of Cretaceous granodiorite and tonalite. (Morton and Miller, 2006).

Surficial geology within Perris South is generally Quaternary alluvial fan deposits, typically older than the alluvial fan deposits of Canyon, Upper Pressure, Lower Pressure, Lakeview, and Hemet North. Younger deposits are present along the San Jacinto River and Salt Creek. Subsurface materials in Perris South fill a bedrock trough with interbedded and mixed sand, gravel, silt, and clay, and are shown through all or portions of the following cross sections.

- Longitudinal cross sections B1 – B1', K1 – K1', N1 – N1'
- Transverse cross sections: L – L', C1 – C1', E1 – E1', M – M', N – N'

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 400 ft bgs, with wells as deep as approximately 1,000 ft bgs.

Groundwater production, based on available well test data provided at the time of drilling, has a median value less than 100 gpm, with a 25th percentile value of less than 100 gpm and a 75th percentile value of 300 gpm. The maximum yield is 2,100 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well. Approximately 10% of the groundwater produced within the San Jacinto Groundwater Basin is produced from Perris South.

Previous work in the area estimated aquifer hydraulic conductivities to range from less than 5 to 30 feet/day with the highest conductivities in the alluvium and lowest conductivities in consolidated silty fine sand deposits and siltstones (TechLink 2002). No detailed aquifer test data are available for Perris South. This range is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within Perris South was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 5.8 mg/l and a TDS concentration of 2,400 mg/l (SAWPA, 2014).

2.3.3.6 Menifee GMZ

Menifee GMZ is located in the southwestern portion of the Basin, as shown in Figure 21, and includes urban areas such as portions of the City of Menifee and agricultural and undeveloped areas. Menifee is west of the Diamond Valley Lake; east of smaller unnamed hills; south of Perris South GMZ; and north of Bell Mountain. The hydrology, geology, and hydrogeology are presented below.

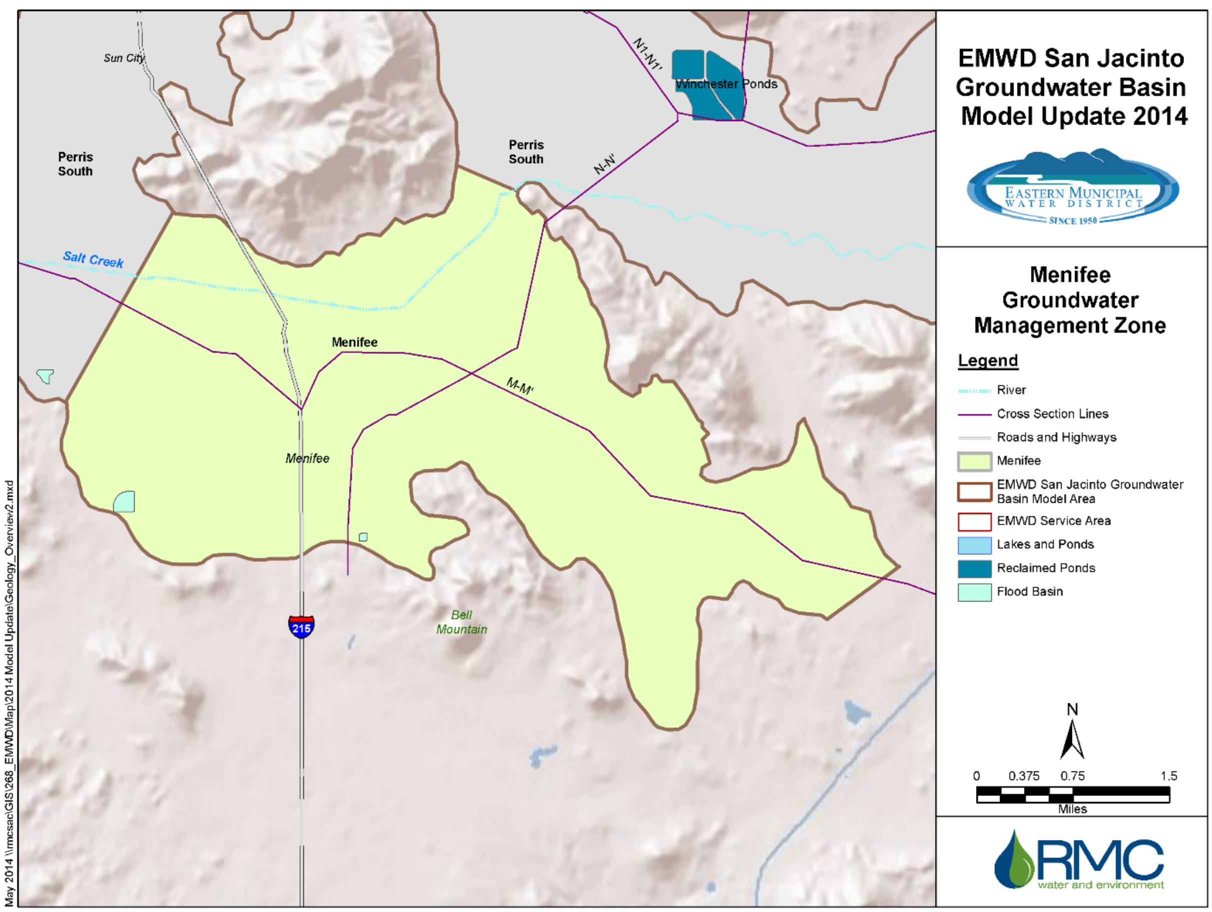


Figure 21: Menifee GMZ

Hydrology

Hydrologic features in Menifee include stormwater facilities and the intermittent Salt Creek. Salt Creek, while rarely having flow, enters from and exits to Perris North. Salt Creek is gauged downstream in the Perris South, as previously discussed.

Additional considerations of the hydrology in the Menifee include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Geology/Hydrogeology

Menifee GMZ is a brackish groundwater basin with depth to bedrock of up to 700 feet. The brackish nature of the groundwater is believed to be caused by historical land uses in the area. The deepest portions of the basin along the axis of the valley in a buried bedrock trough and shallower bedrock adjacent to the hills to the north, east, and south (Figure 6).

The Menifee is bounded by Cretaceous granodiorite and tonalite to the east and west. The unnamed hill to the east of Sun City on the northern edge of Perris South is composed of Triassic quartzite and quartz-rich metasandstone, Triassic phyllite, and Cretaceous gabbro. Triassic quartzite and quartz-rich metasandstone and Cretaceous gabbro are also present at the southern boundary and the hills south of Winchester are comprised of Cretaceous granodiorite and tonalite. (Morton and Miller, 2006).

Surficial geology within Perris South is generally Quaternary alluvial fan deposits, typically older than the alluvial fan deposits of Canyon, Upper Pressure, Lower Pressure, Lakeview, and Hemet North. Younger deposits are present along Salt Creek. Subsurface materials include interbedded and mixed sand, gravel, silt, and clay and are shown through all or portions of the following cross sections:

- Longitudinal cross sections M – M’
- Transverse cross sections: N – N’

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 500 ft bgs, with wells as deep as nearly 700 ft bgs.

Groundwater production, based on available well test data provided at the time of drilling, has a median value of 100 gpm, with a 25th percentile value of less than 100 gpm and a 75th percentile value of 600 gpm. The maximum yield is 1,800 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well. Most ground water is produced in the central and eastern parts of the GMZ. Approximately 5% of the groundwater produced within the San Jacinto Groundwater Basin is produced from Menifee.

Previous work in the area estimated aquifer hydraulic conductivities to range from about 5 to 30 feet/day (TechLink 2002). No detailed aquifer test data are available for Menifee. This range is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within Menifee was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 4.6 mg/l and a TDS concentration of 2,030 mg/l (SAWPA, 2014).

2.3.3.7 Hemet South GMZ

Hemet South GMZ is located in the southern portion of the Basin, as shown in Figure 22, and includes urban areas such as portions of the City of Hemet; unincorporated areas of Winchester, Green Acres, and East Hemet; and agricultural and undeveloped areas. Hemet South is west of Upper Pressure; east of Perris South; south of Tres Cerritos and the Lakeview Mountains; and north of the Domenigoni Mountains. The hydrology, geology, and hydrogeology are presented below.

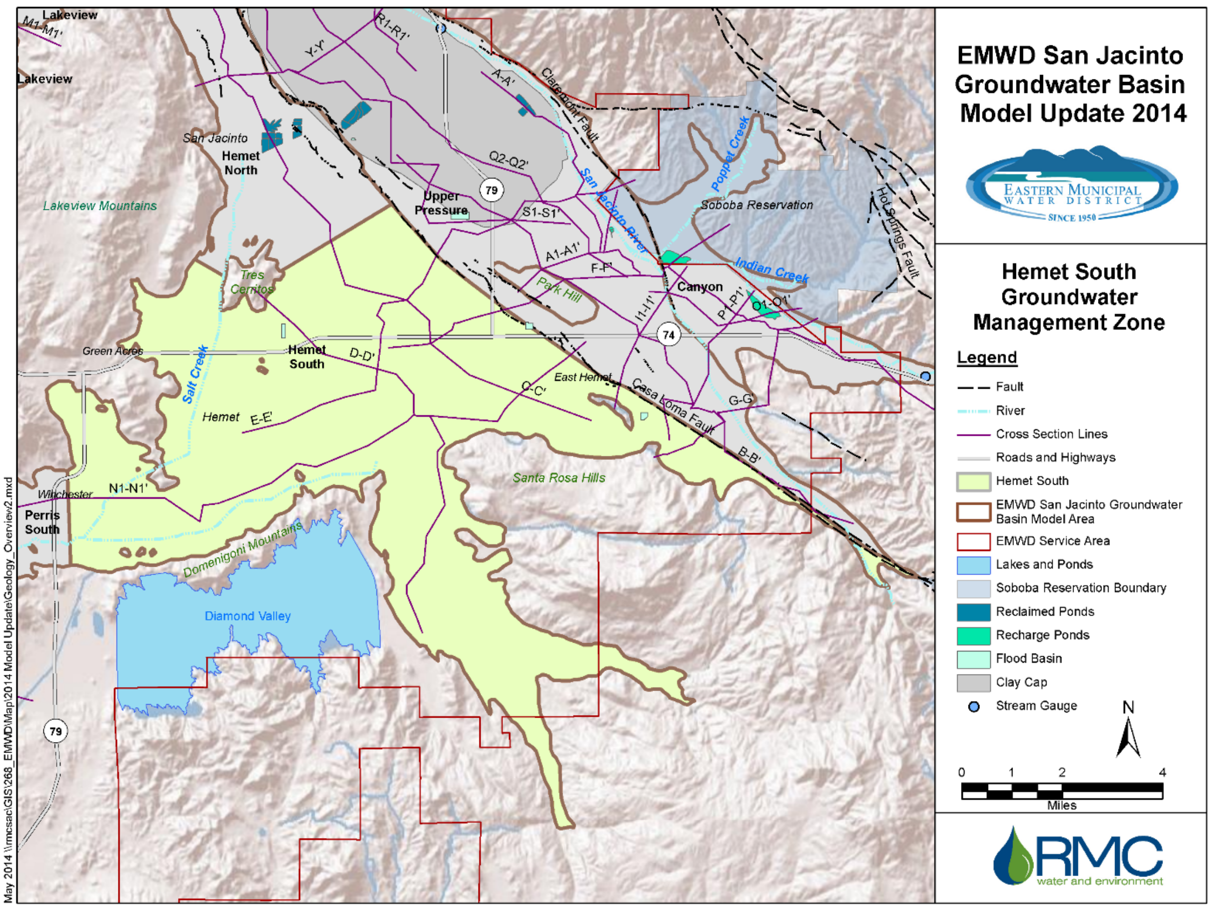


Figure 22: Hemet South GMZ

Hydrology

Hydrologic features in Hemet South include stormwater facilities and the intermittent Salt Creek. Salt Creek, while rarely having flow, exits to Perris North. Salt Creek is gauged downstream in the Perris South, as previously discussed.

Additional considerations of the hydrology in the Hemet South include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Geology/Hydrogeology

The Hemet South GMZ is bordered by the Casa Loma Fault Zone on the northeast, by the Lakeview Mountains, and by neighboring GMZs, Hemet North and Perris South. Hemet South is located to the southeast of the San Jacinto Graben, and thus does not have the very deep bedrock conditions of Upper Pressure and Lower Pressure. Depth to bedrock in Hemet South is up to 900 feet, with the deepest portions of the basin along the central axis of the GMZ, running east to west. Along this axis, the depth to bedrock is greater closer to the eastern and western boundaries with a saddle in the central portion of the basin with a depth of approximately 350 feet. The depth to bedrock is illustrated in Figure 6.

Surficial geology within Hemet South is generally Quaternary alluvial fan deposits, generally younger deposits similar in age to those in the eastern part of the basin, and younger than much of the alluvial deposits in the western part of the basin. The Lakeview Mountains are composed primarily of tonalite of the Cretaceous Lakeview Mountains pluton. Triassic quartzite and quartz-rich metasandstone make up the Domenigoni Mountains to the south while Cretaceous tonalite comprises the Santa Rosa Hills, also to the south (Morton and Miller, 2006; Morton and Matti, 2004).

While small, the most significant surface water features is the intermittent Salt Creek, with fluvial deposits along its course.

A series of 33 cross-sections were generated based on lithologic logs, downhole geophysical logs, well construction logs, water quality, water levels, areal geophysics, photographic review, literature review, and field observations. Subsurface materials for Hemet South are shown through all or portions of the following cross sections:

- Longitudinal cross sections: E – E’, F – F’, N1 – N1’, C – C’
- Transverse cross sections: D – D’, Y – Y’

Water-bearing materials include interbedded and intermixed deposits of sand, gravel, silt, clay, cobbles, and boulders common to other areas.

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 600 ft bgs, with wells as deep as nearly 900 ft bgs.

Groundwater production, based on available well test data provided at the time of drilling, has a median value of 200 gpm, with a 25th percentile value of less than 100 gpm and a 75th percentile value of 900 gpm. The maximum yield is 2,000 gpm. Note that well performance is a function of aquifer materials, well construction, and the intended use of the well. Approximately 12% of the groundwater produced within the San Jacinto Groundwater Basin is produced from Hemet South.

Previous work in the area estimated aquifer hydraulic conductivities to range between 9 and 24 feet/day. Specific yield in the upper 200 feet of the saturated sediments is estimated to range between 7 and 20 percent (TechLink 2002). No detailed aquifer test data are available for Hemet South. This range is the basis for initial parameters for this effort.

The ambient water quality for 1993-2012 within Hemet South was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 5.7 mg/l and a TDS concentration of 940 mg/l (SAWPA, 2014).

2.3.3.8 Canyon GMZ

Canyon GMZ is located in the southeastern portion of the Basin, as shown in Figure 23, and includes the Soboba Reservation, portions of the unincorporated urban area of Valle Vista, agricultural areas, and undeveloped areas. Canyon is located to the east of Upper Pressure; west of the San Jacinto Mountains; and north of Rouse Hill. The hydrology, geology, and hydrogeology are presented below.

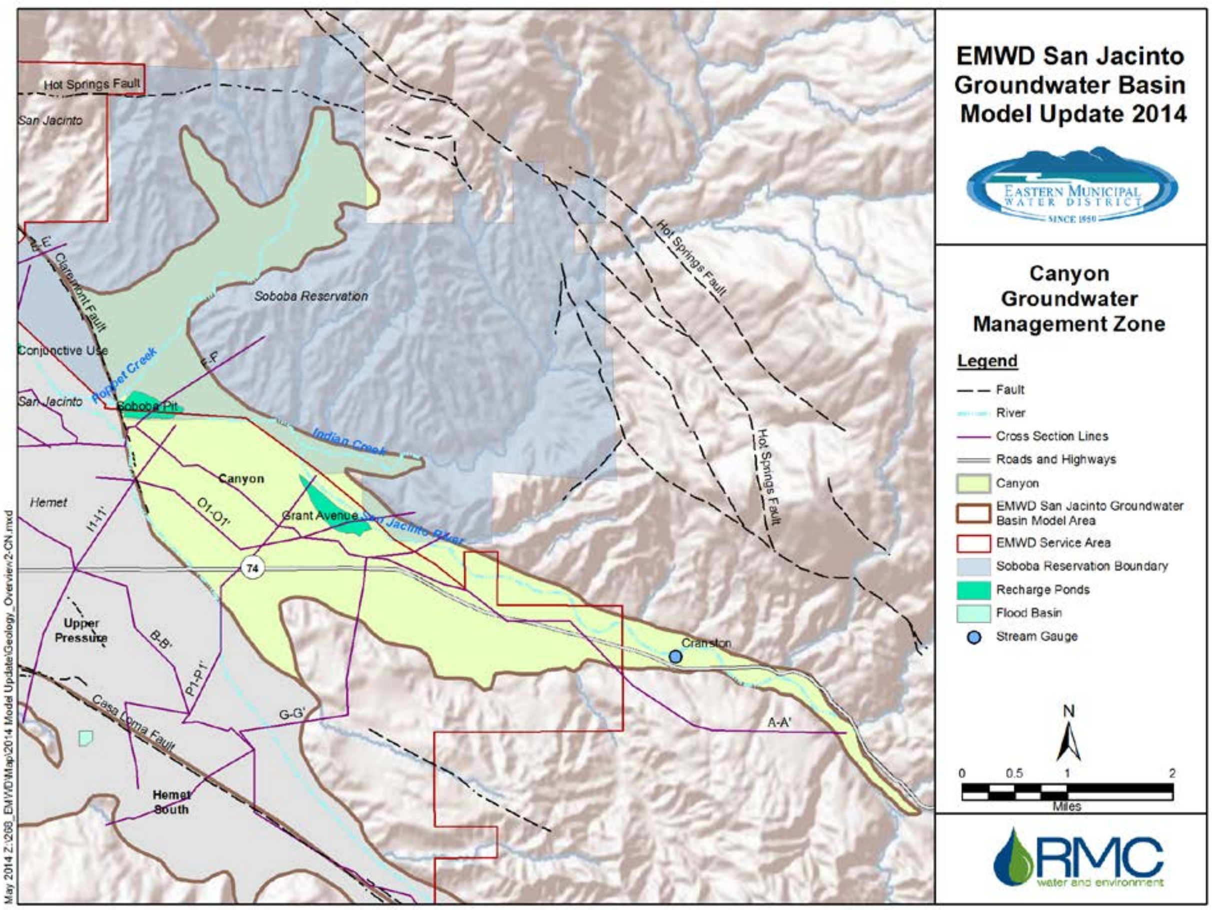


Figure 23: Canyon GMZ

<u>Hydrology</u>

Hydrology in the Canyon includes three surface water courses; Poppet Creek and Indian Creek both feed into the San Jacinto River (see Figure 23), which is the main water course in the Canyon Sub-Basin, flowing from the southeastern portion of the basin to the northwestern corner. Additionally, Bautista Creek flows along a portion of the boundary between Canyon and Upper Pressure. The San Jacinto River is intermittent, generally flowing during the winter and spring months. The streambed elevation of the San

Jacinto River drops about 650 feet vertically over approximately seven miles within the Canyon. The San Jacinto River exits the Canyon by crossing the Claremont Fault into the Upper Pressure. The lowest elevation in the Canyon is at the point it crosses into the Upper Pressure.

Streamflow has been measured on the San Jacinto River at two locations in and near the Canyon Sub-Basin: an upstream location at the Cranston Gauge (USGS Gauge Number 11069500) and a downstream location at the State Street Gauge (USGS Gauge Number 11070150) in the Upper Pressure. Locations of these gauges are provided in Figure 23 and Figure 11 for the Cranston and State Street gauge, respectively. Photographs of the Cranston Gauge and the State Street Gauge are shown in Figure 24 and Figure 12, respectively. Gauges have also measured streamflow at several locations over time on Bautista Creek, which is slightly outside of the Canyon Sub-Basin and is tributary to the San Jacinto River upstream of the State Street Gauge.

Streamflow measured at the Cranston Gauge is highly variable, both seasonally and from year-to-year, with significantly higher streamflows in the spring, little streamflow in the fall, and variability between years. While the Cranston Gauge is the best available source of streamflow data in this area, the USGS (2014) indicates that the records are poor. Additional estimates of streamflow along the San Jacinto River have been developed by Guay (2002).

Streamflow in the San Jacinto River is significantly lower downstream of the Canyon Subbasin. This is shown through flows recorded at the upstream (Cranston Gauge) and downstream (State Street Gauge) gauges, particularly during low-flow conditions. Much of the streamflow seen at the Cranston Gauge recharges groundwater prior to reaching the State Street Gauge, largely within the Canyon Sub-Basin streambed or in the Soboba Pit.

The Soboba Pit is an excavated sand and gravel quarry within the San Jacinto River that captures all but the highest flows and allows for this water to recharge groundwater. The maximum depth of the Soboba Pit was approximately 70 ft bgs. It is currently a capture point for San Jacinto River flows, allowing recharge in the Canyon Basin, and acting as a detention basin during large flow events. The location of the Soboba Pit is shown in Figure 23 and a photograph of the pit during dry periods (January 2014) is shown in Figure 25.

Groundwater is actively recharged in the Canyon GMZ at the Grant Avenue Ponds located within the San Jacinto River floodplain at the intersection of Grant Avenue and Palm Avenue in the unincorporated community of Valle Verde. The Grant Avenue Ponds are operated by diverting river flow into approximately 30 acres of percolation ponds. EMWD holds a diversion permit for up to 5,760 AFY but diversions are variable based on need and water availability, with diversions over the 2008 – 2014 period ranging from 0 AF in 2012 and 2013 to 4,962 AF in 2010.

Additional considerations of the hydrology in the Canyon include precipitation, agricultural return flows, direct and indirect water sales/application, flood control channels, detention basins, retention basins, the LHMWD water distribution flume, and water holding ponds as well as past and current land use. All of these considerations are discussed in other sections of this report.

Figure 24: Cranston Gauge (USGS 11069500)

Figure 25: Soboba Pit

Geology/Hydrogeology

The Canyon is bounded on the west by the Claremont Fault and on the east by the San Jacinto Mountains. The maximum depth of the alluvial basin is not known as crystalline bedrock has not been encountered in any of the wells in the central portion of the basin.

Recent alluvium from the San Jacinto River and its tributaries are the primary water-bearing materials in the GMZ, with the deeper Bautista Formation yielding lower volumes of water. Alluvial materials in Canyon are a mix of gravels, sands, silts, and clays, with proportionally more coarse grained materials than the rest of the basin. Older alluvial deposits appear very similar to younger alluvium while drilling in the area and downhole geophysical logs also show similar characteristics. The older alluvium are only discernable by their water production rates, which are significantly lower than the younger alluvium, and minor local variations in water quality. The older alluvium generally occurs from about 250 ft bgs to 600 ft bgs. Below approximately 600 ft bgs the geology appears to be comprised of Bautista formation, a Pleistocene arkosic sandstone with silty and clayey beds, to an unknown depth.

Significant faulting and folding complicates the basin geology, particularly within the Bautista Formation; this faulting and folding is thought to result in rising groundwater in portions of the alluvial aquifer as groundwater pools behind and overflows these structures, noted by increases in riparian vegetation along the San Jacinto River. Along the San Jacinto River, at approximately four points, groundwater rises to the surface for short distances only to percolate into the ground again tens of feet downstream. Most recently, groundwater was observed by EMWD personnel daylighting at the location of Citizens Dam in 2012. The other three areas of groundwater rise have been identified by isolated Cottonwood groves where no apparent surface water sources were present. (J. Daverin, 2015, pers. comm. December 14), It is not known the exact nature of the geologic structures forcing groundwater to the surface, although the most likely causes are unmapped faults or geologic bedding contacts.

Groundwater flows from south to north mimicking the topography and flow direction of the San Jacinto River. As the lowest area of the Canyon GMZ is located at the nearly impermeable Claremont Fault. The Claremont Fault is a significant barrier to flow between Canyon and Upper Pressure with groundwater levels typically more than 200 feet higher in Canyon. The fault is not a barrier to flow along the current course of the San Jacinto River in the more recent deposits within approximately the upper 40 to 60 feet of the subsurface. Historically, the area in Canyon above the Claremont Fault was subject to rising water caused by the low-conductivity fault and the significant recharge from the San Jacinto River above the fault. These conditions resulted in the area of rising water being termed the “cienega” or “swamp” in Spanish. This area is the site of a number of groundwater production wells that have effectively reduced water levels below ground surface for the last few decades.

Subsurface materials in Canyon are shown through all or portions of the following cross sections.

- Longitudinal cross sections: A – A’
- Transverse cross sections: G – G’, P1 – P1’, I1 – I1’, F – F’, A1 – A1’
- Mixed longitudinal and transverse cross sections: O1 – O1’

As shown in Table 3, existing and historical groundwater wells are typically screened between 100 and 700 ft bgs, with wells as deep as nearly 1,300 ft bgs.

Groundwater production, based on available well test data provided at the time of drilling, has a median value of less than 100 gpm, with a 25th percentile value of less than 100 gpm and a 75th percentile value of 1,200 gpm. The maximum yield is 4,900 gpm. The highest yields occur in wells drilled in the vicinity of the fault separating Canyon and Upper Pressure in the Cienega area. Note that well performance is a function of both aquifer materials and well construction and the intended use of the well; these data include domestic, irrigation, and municipal wells. Approximately 15% of the groundwater produced within the San Jacinto Groundwater Basin is produced from Canyon.

Aquifer hydraulic conductivities are estimated to range between 4 and 42 feet/day. Aquifer test data are available for Soboba wells DW-3 and DW-4, with transmissivity between 47,000 and 52,000 gpd/ft at DW-3 and 26,000 gpd/ft at DW-4.

The ambient water quality for 1993-2012 within Canyon was estimated by SAWPA, with a Nitrate-Nitrogen concentration of 2.0 mg/l and a TDS concentration of 340 mg/l (SAWPA, 2014). Groundwater with the lowest TDS concentrations occurs in the vicinity of the Claremont Fault.

2.4 Groundwater Inflow

Groundwater inflows were comprised of several components that contribute to groundwater recharge and were calculated using GIS analysis. These components included:

- Distributed Recharge
- Point Recharge Sources
- River Recharge
- Mountain Front Recharge
- Contribution from Surface Water Reservoirs

2.4.1 *Distributed Recharge*

Distributed recharge is widespread recharge from applied water components, which included:

- Rainfall
- Water Sales (EMWD, Subagencies, Recycled Water)
- Irrigation

2.4.1.1 Methodology for Estimating Distributed Recharge Rates

The amount of distributed recharge that percolates deep into the aquifer was calculated based on the percentage of pervious land surface and soil drainage properties at the recharge location. The components of distributed recharge are presented in the following section and the methodology for estimating recharge from distributed sources is discussed in more detail in Section 3.7.

2.4.1.2 Land Use Conditions

Land use conditions were used to determine the percentage of ground cover that was likely to allow water to percolate, and they were used in conjunction with corresponding soil types to calculate the percolation potential of the area. Ultimately, the land use data was a component in calculating the amount of aerial recharge that occurred at various levels of land development.

Land use in the basin changed drastically throughout the model period due to urbanization. The model incorporated a temporally and spatially varying representation of land use to best represent conditions that existed in the region throughout the study period (1984-2012).

Three different land use coverages were provided by EMWD for use in the model: 1999, 2003, and 2010. Several land use data sources were evaluated by EMWD and it was concluded that the Riverside County Assessor's Office provided the best source of recent data. The 2003 and 2010 land use coverages originated from the Riverside County Assessor's Office. This office tracks recent land use for all parcels within the county. An additional source of data for agriculture, including dairies, comes from the Western Riverside County Agriculture Coalition (WRCAC). No electronic parcel data from the Riverside County Assessor's Office was available for dates prior to 2003. In addition to the Assessor's Office data, a 1999 land use coverage developed by EMWD was provided. This coverage was the oldest, most reliable electronic historical land use dataset available. The land use coverages were associated with a range of time periods throughout the model. Due to the different sources of land use data between 1999 and 2003, there may be inconsistencies between land use designations Table 4 presents the model years that are associated with the respective land use coverage time periods.

Table 4: Land Use Coverages and Associated Model Periods

Land Use Coverage Year	Model Period
1999	1984-1999
2003	2000-2006
2010	2007-2012

Raw land use data for each time coverage was categorized into numerous types and subcategories of four major land use types of agriculture, commercial, residential, and vacant. There were over 60 subcategories in the 2010 dataset (Figure 26). To simplify the coverages, land use types were evaluated and simplified by grouping them into the following four general categories.

- Agriculture
- Commercial
- Residential
- Vacant

An example of categorization process is shown with the 2010 land use data in Figure 26. Figure 27 and Figure 28 show the final classified land use maps for 1999 and 2003, respectively.

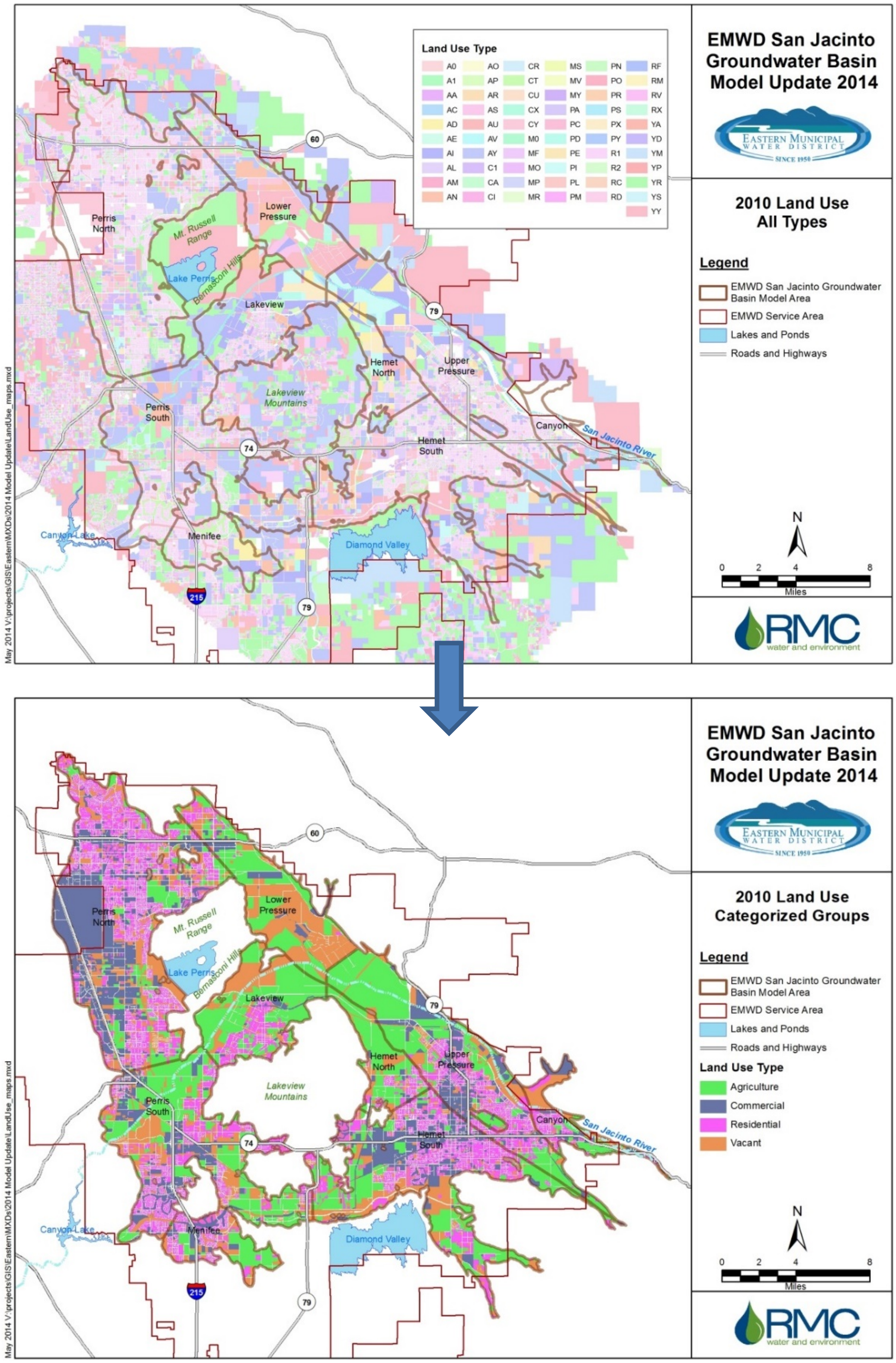


Figure 26: Categorization of 2010 Land Use Data

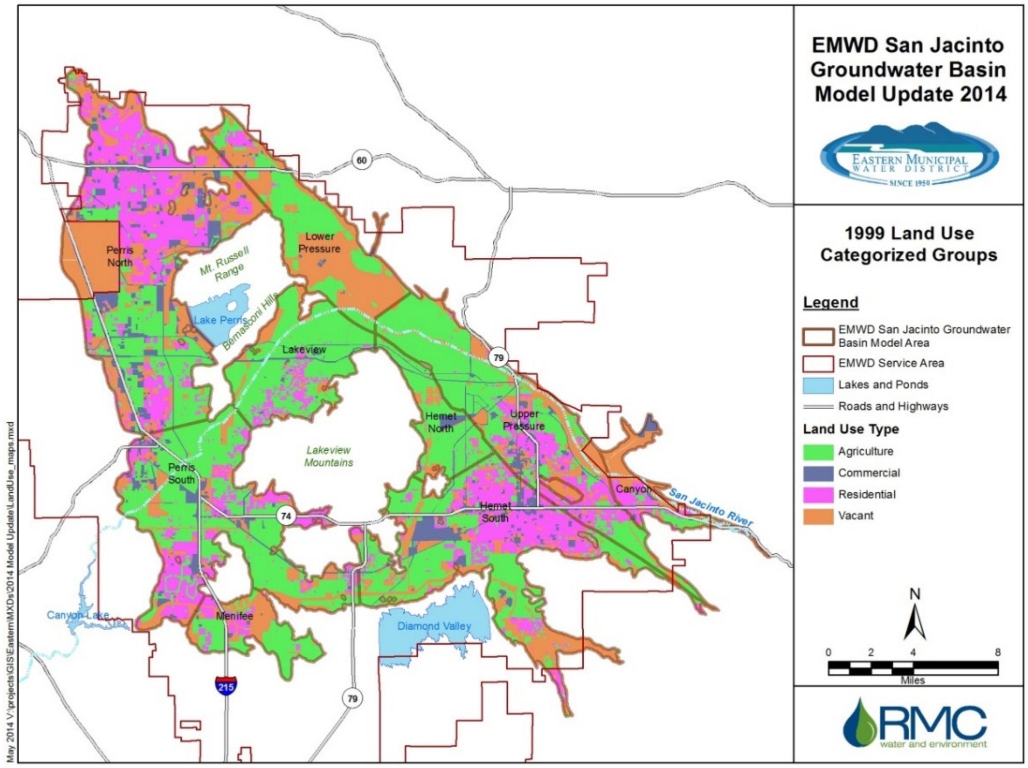


Figure 27: 1999 Categorized Land Use

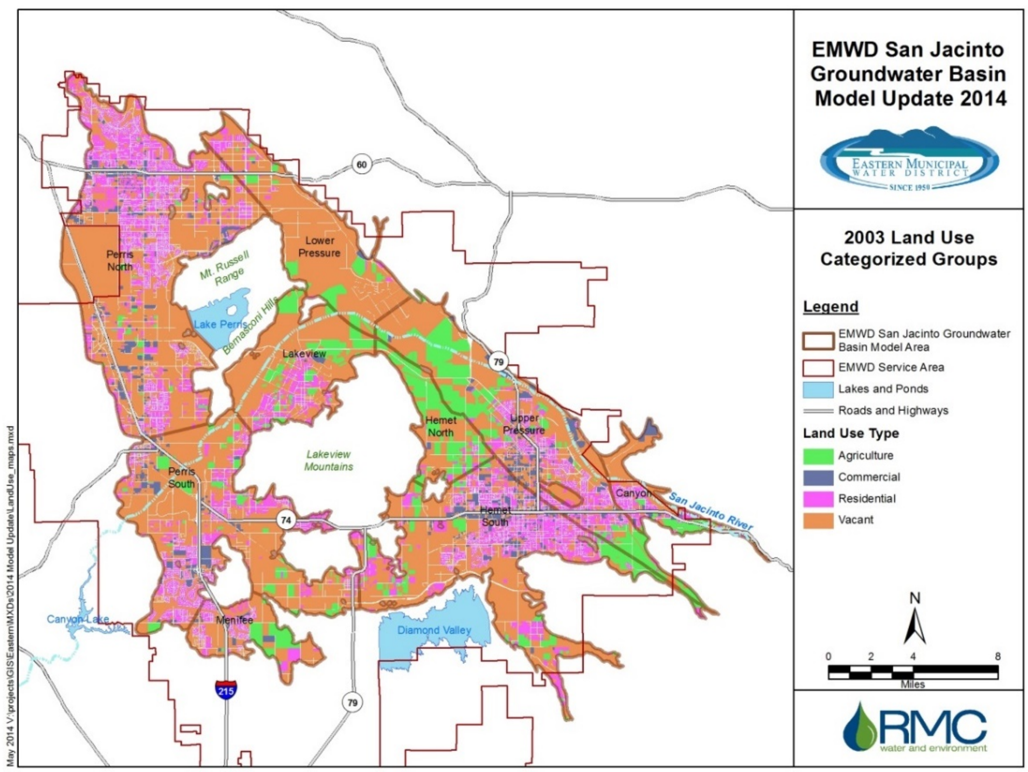


Figure 28: 2003 Categorized Land Use

2.4.1.3 Soils

Soil types were another component in the model used to calculate the amount of aerial recharge that infiltrates into the groundwater. They were used in conjunction with the corresponding land use type to calculate the potential percolation of the area.

The Natural Resources Conservation Service (NRCS) classifies soils into hydrologic soil groups (HSGs). The HSG's are divided into four groups: A, B, C and D. Group A soils are typically sandy soils and have higher infiltration rates while Group D soils are clays with lower infiltration rates. The distribution of HSGs in the Basin is shown in Figure 29.

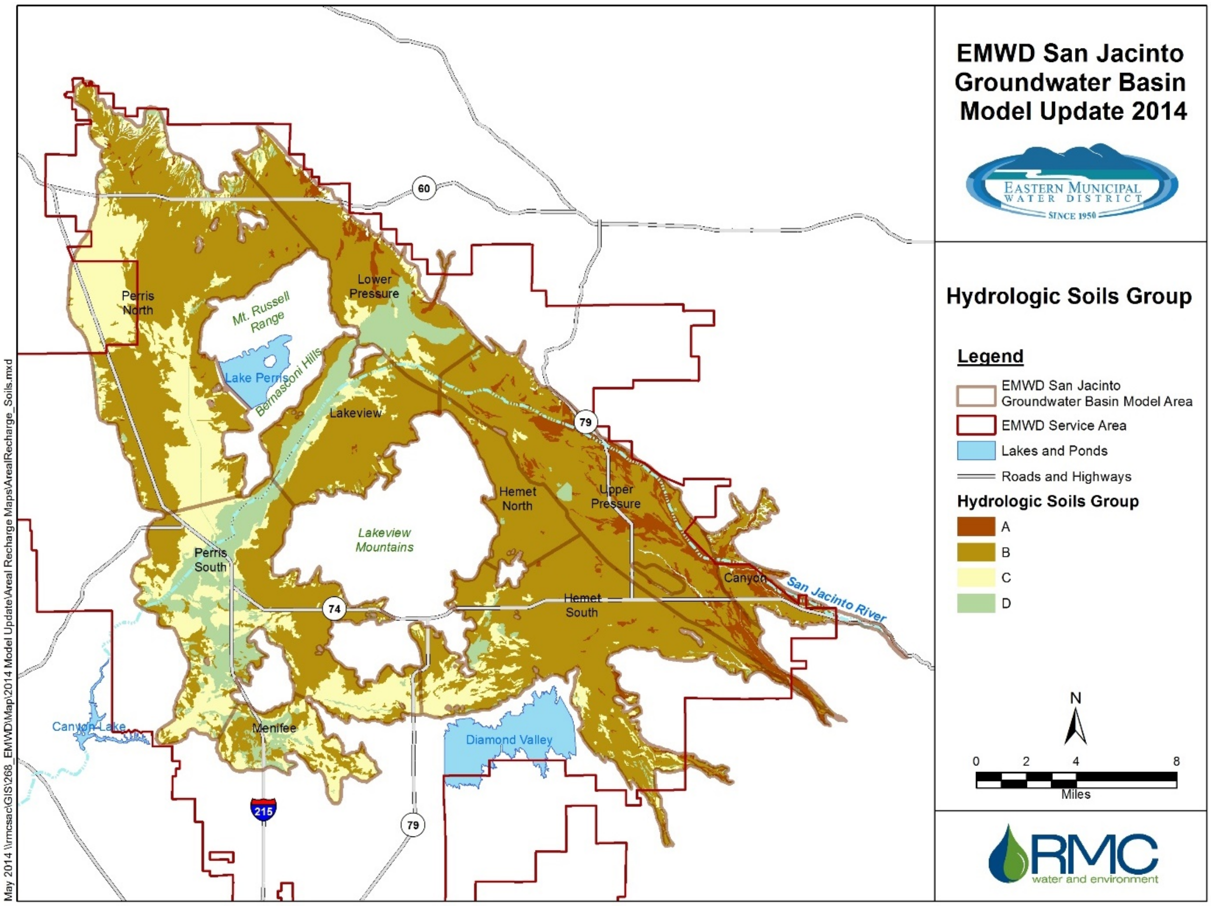


Figure 29: Hydrologic Soil Group in the Basin

2.4.1.4 Rainfall

There are several rain gauges located within the Basin. The following four gauges from the Riverside County Flood Control and Water Conservation District (RCFC&WCD) have sufficient spatial and temporal representation of the Basin and were used for rainfall data in the SJFM-2014.

- San Jacinto (RCRC&WCD Station 186)
- Perris Reservoir (RCRC&WCD Station 151)
- Winchester (RCRC&WCD Station 248)

- Moreno Valley (RCRC&WCD Station 110)

The Thiessen polygon method was employed to associate an area of the Basin to each rain gauge, shown in Figure 30. Data for 2011-2012 was not available at the Moreno Valley rain gauge, so data from Moreno Valley East rain gauge (RCRCWCD Station 124) was used to supplement the data. Figure 31 shows total rainfall volumes throughout the Basin by GMZ from 1984-2012. Annual rainfall recorded at the four selected gauges are similar; however, due to their larger areas Perris North and Perris South GMZs receive the largest amounts of rainfall while Hemet North and Canyon receive the least amount. During the simulation period, the basin averaged 10.2 inches/year, approximately one inch below the long-term average (Figure 5).

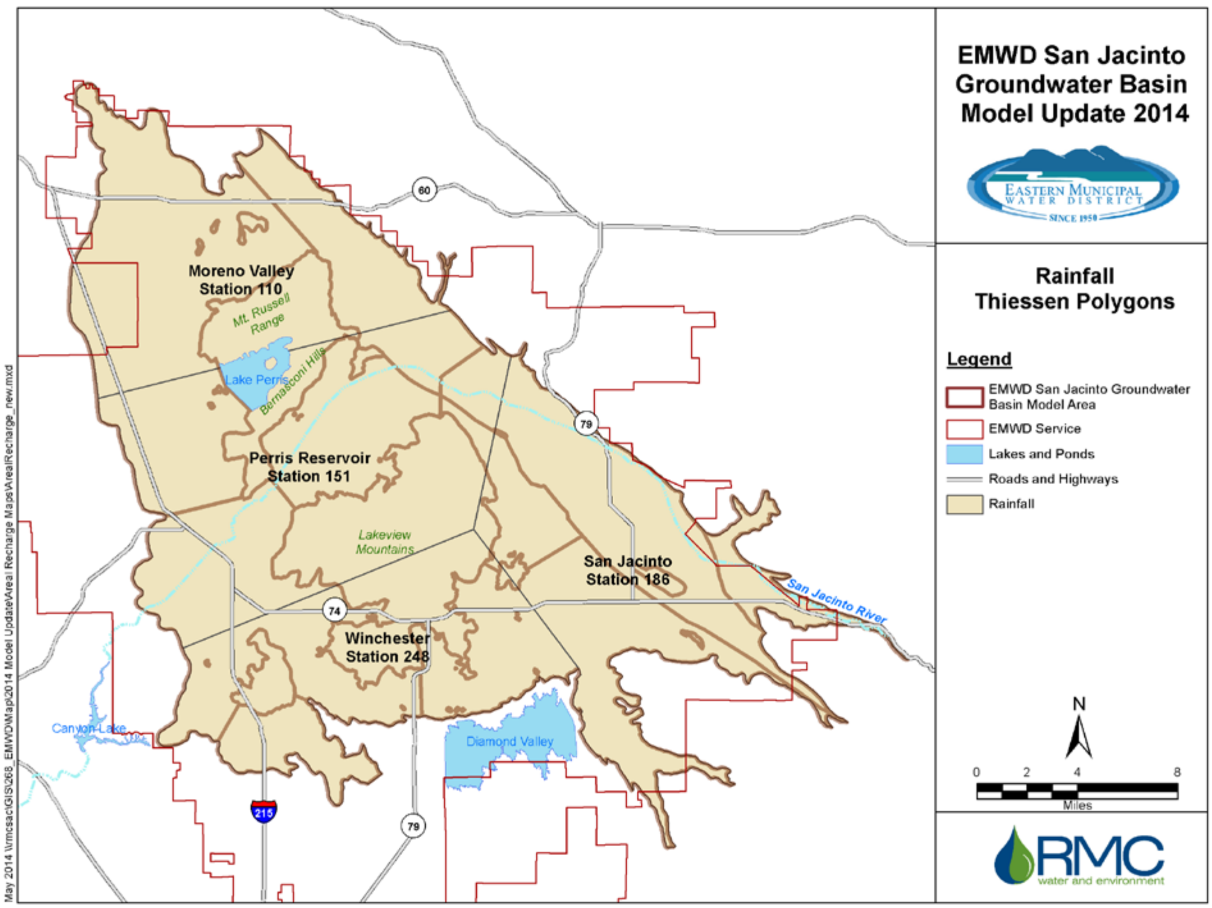


Figure 30: Rainfall Area and Associated Rain Gauge Thiessen Polygons

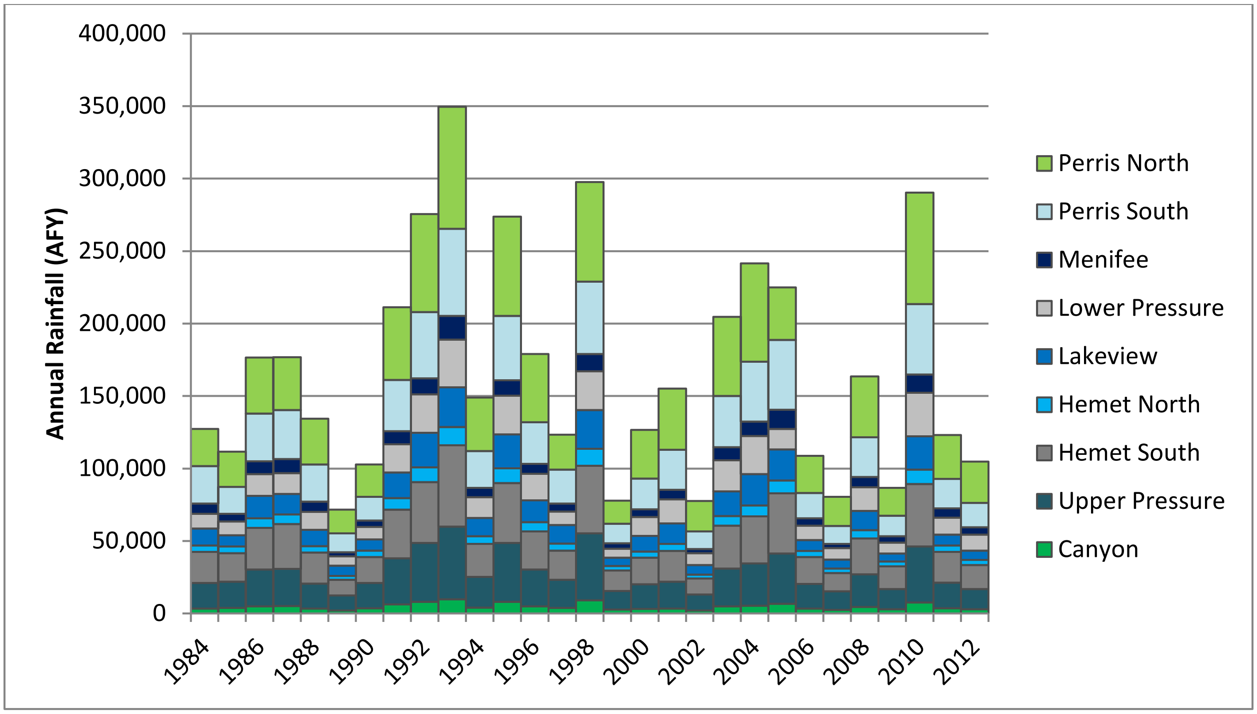


Figure 31: Annual Rainfall in the Basin by GMZ from 1984-2012

2.4.1.5 Water Sales (EMWD, Subagencies, Recycled Water)

EMWD and other subagencies such as LHMWD, City of Hemet, City of San Jacinto, City of Perris and Nuevo Water Company pump groundwater and sell groundwater and imported water to local customers. Approximately 75% of this water is assumed to be used for landscape irrigation and other outdoor uses that contribute to recharge. Figure 32 and Figure 33 show the location of water sales areas for EMWD and corresponding water sales by GMZ, respectively. Similarly, Figure 34 and Figure 35 show this water sales information for the subagencies. EMWD water sales accounts for a majority of water sales in the Basin due to the larger, more widespread water sales areas in comparison to the smaller service areas of the subagencies.

In addition to potable groundwater and imported water sales, EMWD also sells reclaimed water to customers. Reclaimed water is typically used for irrigation, of which a portion will infiltrate into the ground as recharge. Figure 36 and Figure 37 present the location of reclaimed water sales and the quantity of sales within the Basin, respectively.

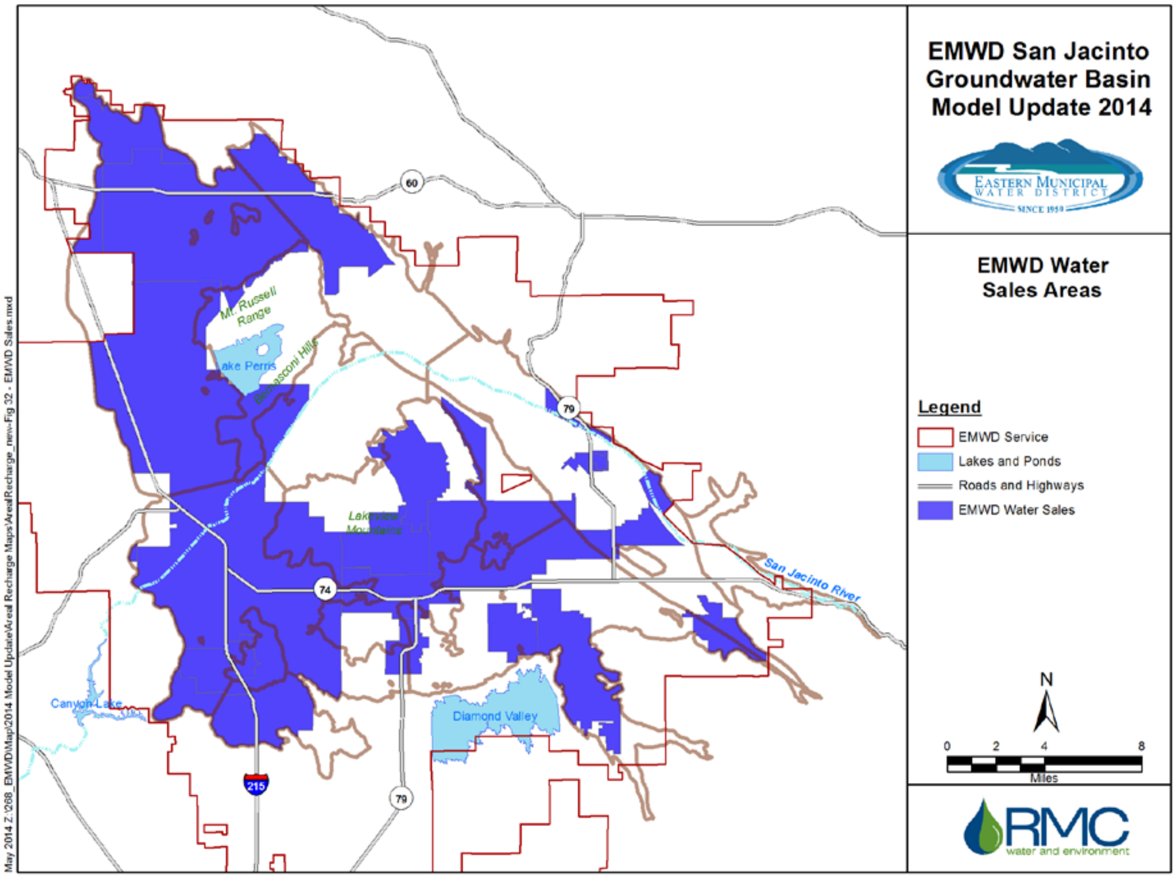


Figure 32: EMWD Water Sales Areas

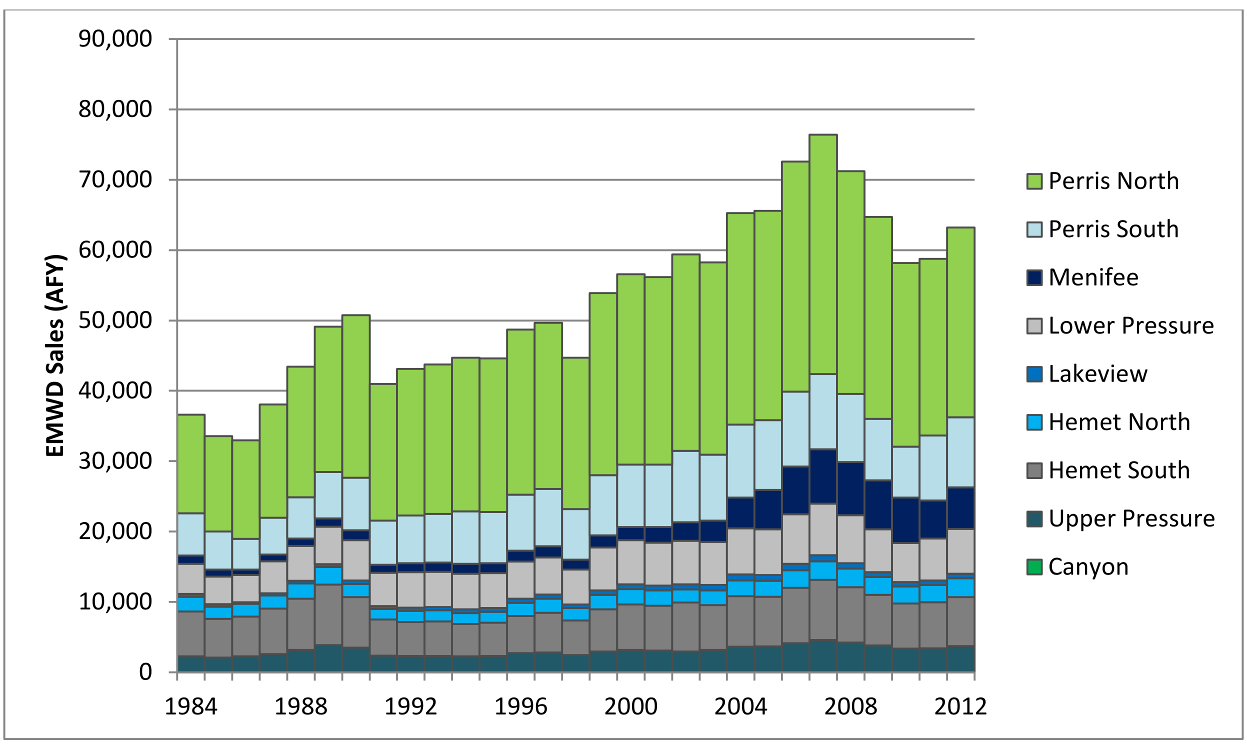


Figure 33: EMWD Water Sales from 1984-2012

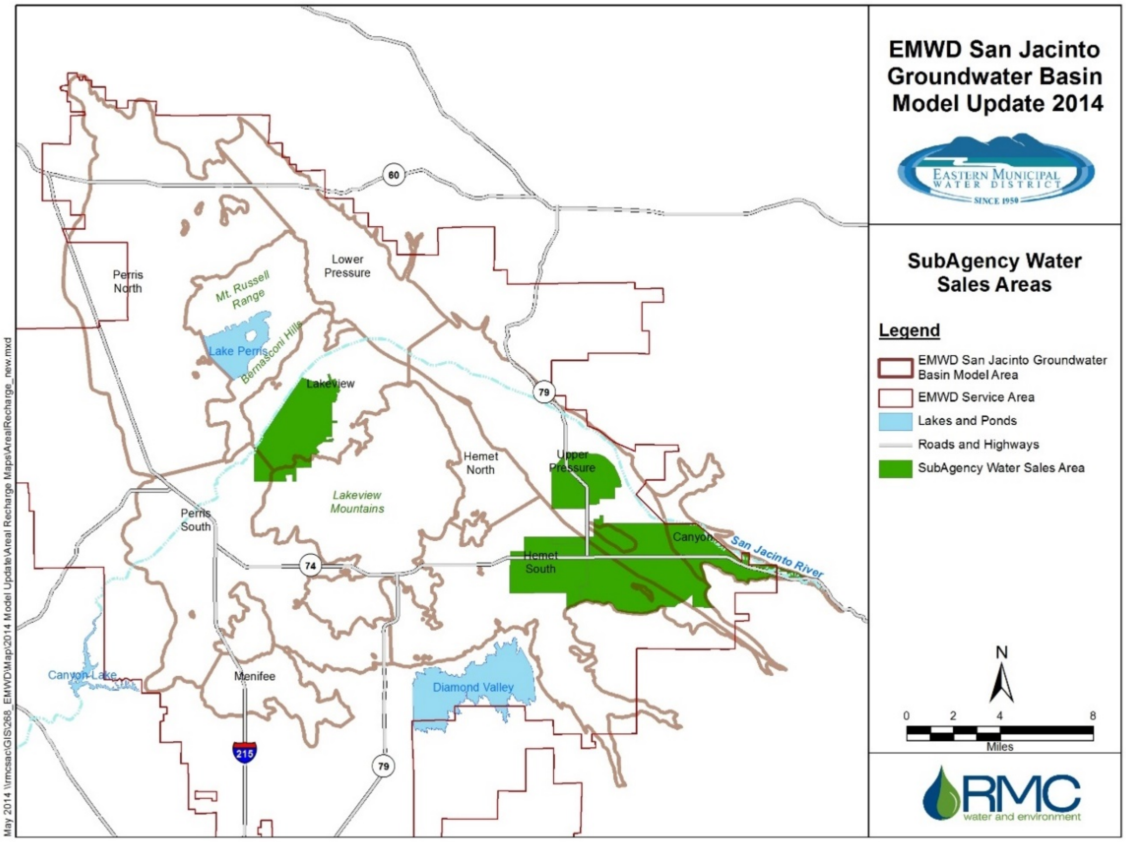


Figure 34: Subagency Water Sales Areas

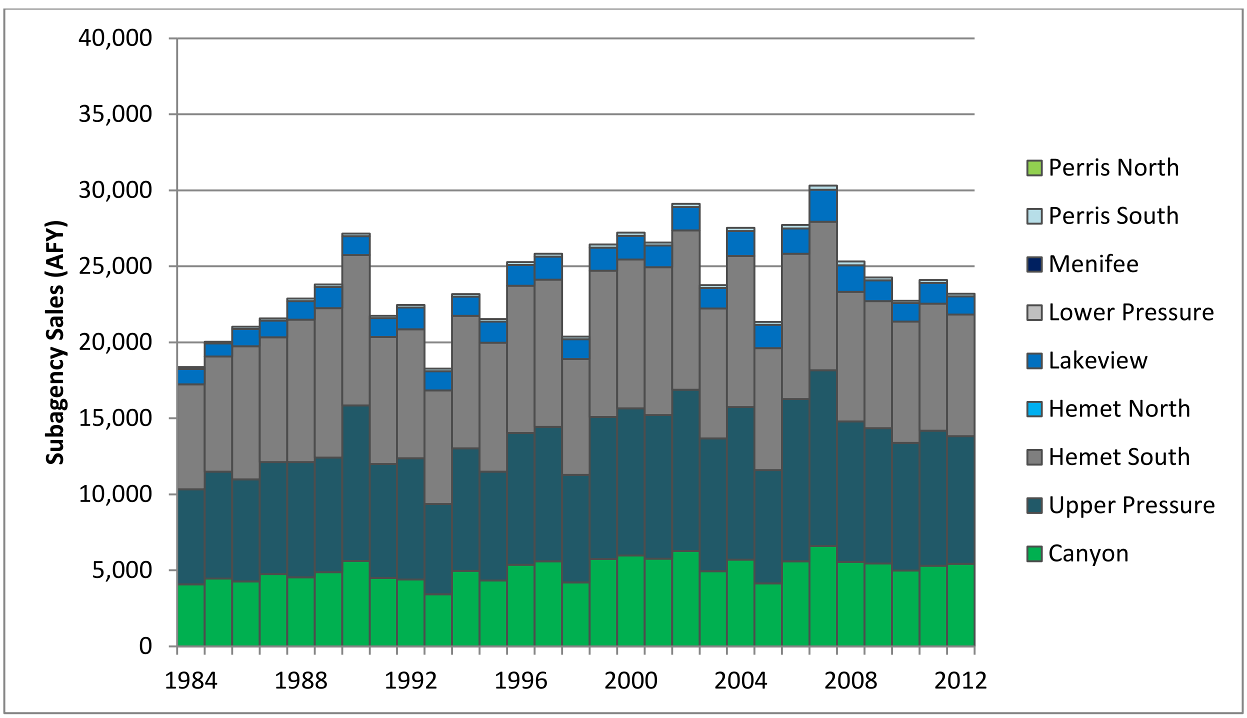


Figure 35: Subagency Water Sales by GMZ from 1984-2012

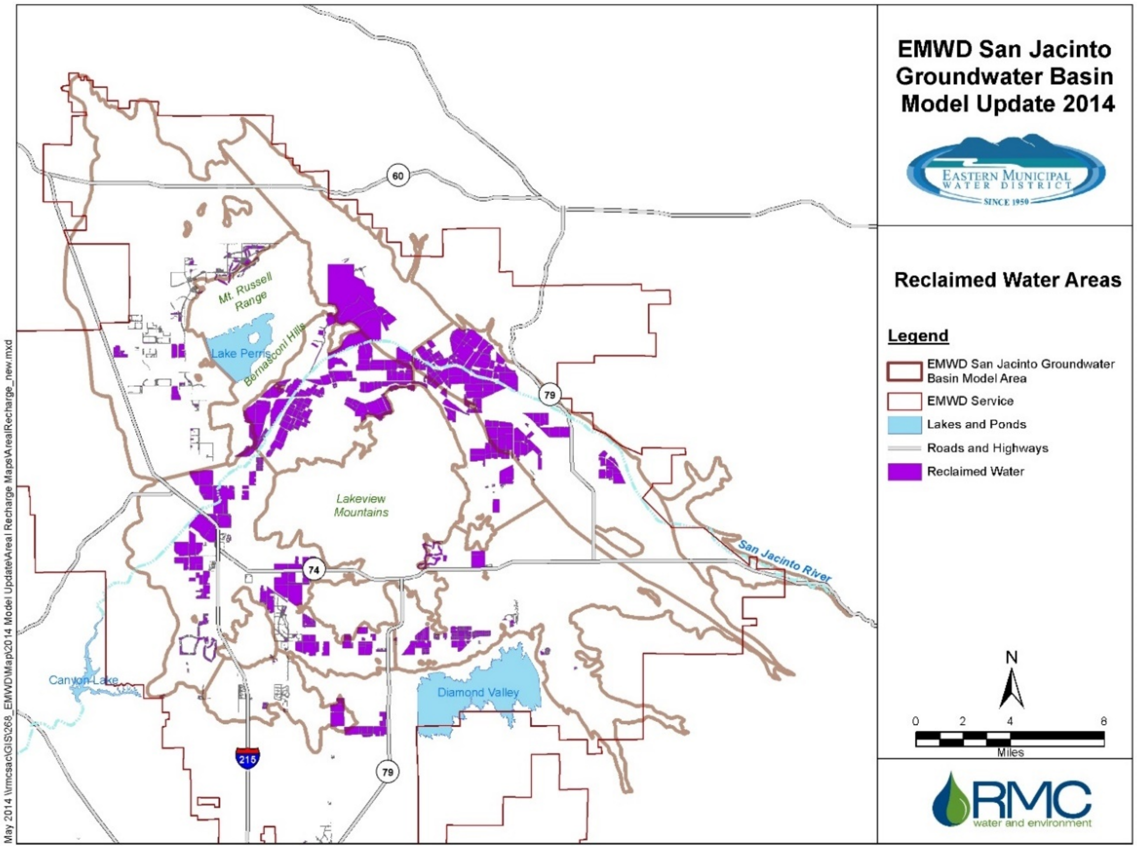


Figure 36: Reclaimed Water Sales Areas

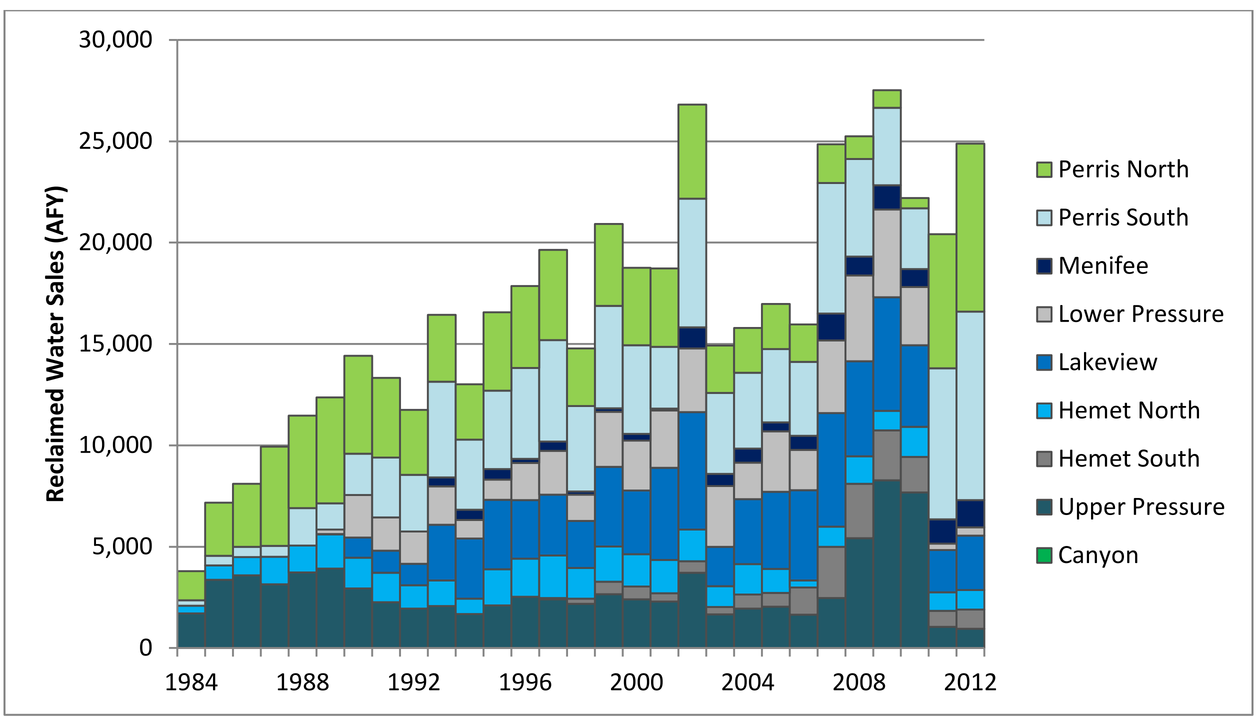


Figure 37: Reclaimed Water Sales by GMZ from 1984-2012

2.4.1.6 Irrigation Applied Water

At the time of this report, agriculture accounted for approximately a third of the land use in the Basin, and was even more prominent in earlier years, prior to urbanization. The irrigation areas are shown in Figure 38. There are currently over 170 identified areas that apply water for agricultural irrigation purposes, a majority of which takes place in the Upper Pressure, as seen in Figure 39.

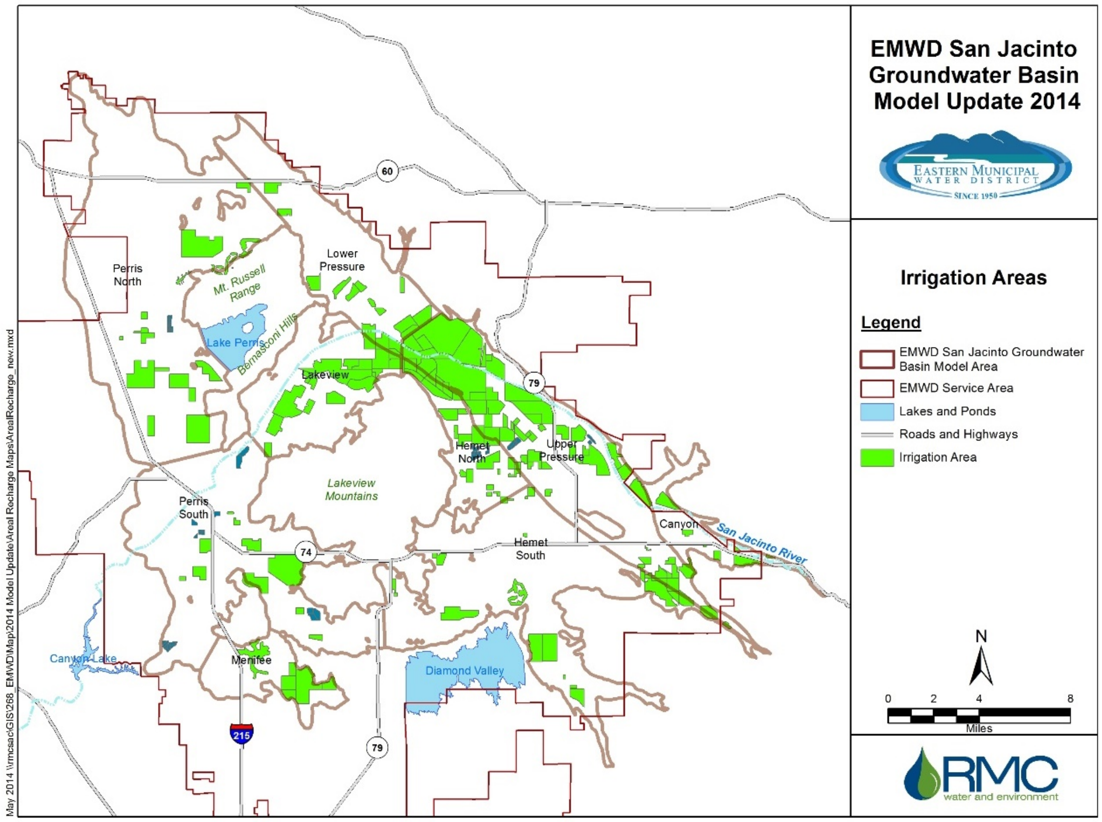


Figure 38: Irrigation Areas

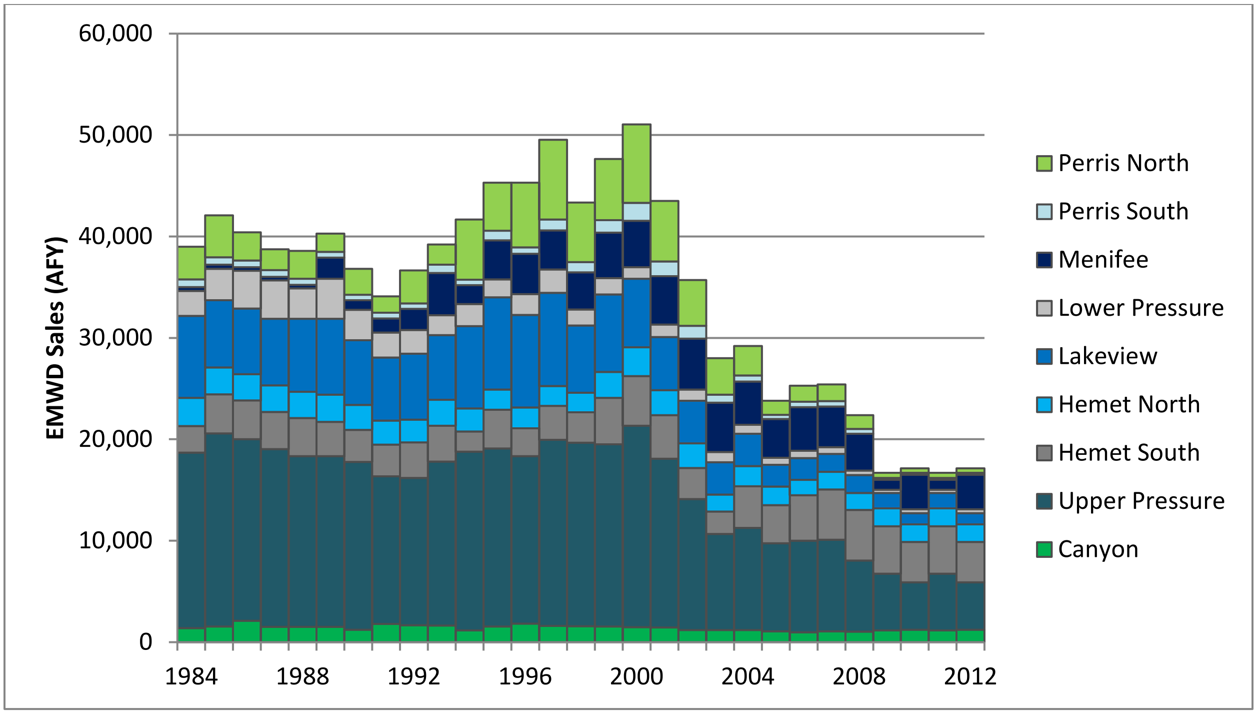


Figure 39: Irrigation Applied Water from 1984-2012

2.4.2 *Point Recharge*

Point recharge contributed to groundwater inflows through several of different sources. This included recharge ponds, incidental recharge from reclamation storage ponds and contribution from surface water reservoirs.

2.4.2.1 Recharge Ponds

Both EMWD and LHMWD hold water rights on the San Jacinto River, allowing them to divert water when river flows are sufficient. As shown in Figure 40, LHMWD has received water from the river during each year of the study period.

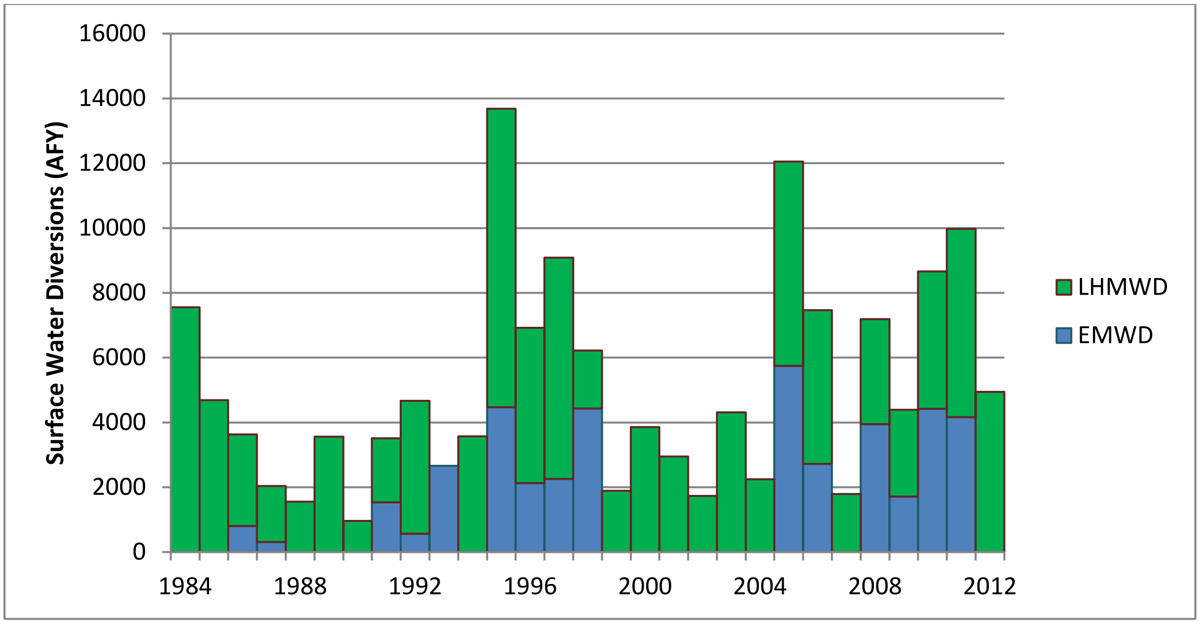


Figure 40: San Jacinto River Diversions

When surface water diversions from the San Jacinto River are made available to EMWD, the Stipulated Judgment and Complaint, Case Number RIC 1207274 requires EMWD to store any diverted water in the groundwater aquifer. This storage is implemented by recharging the diverted water at the Grant Avenue ponds and the Integrated Recharge and Recovery Program (IRRP) ponds. This recharge data was provided by EMWD and input into the model.

The Soboba Pit also contributes to recharge. It is located in Canyon at the boundary of the Upper Pressure and Canyon GMZs where the San Jacinto River crosses into Upper Pressure. The Soboba Pit recharges any water flowing from the San Jacinto River through Canyon before entering into Upper Pressure. Only during years of high flows in the San Jacinto River will water flow into Upper Pressure and past the Soboba Pit when it is full.

2.4.2.2 Reclamation Storage Ponds

Several reclamation facilities are operated within the Basin area, including the San Jacinto Valley Regional Water Reclamation Facility (RWRF), Moreno Valley RWRF, Perris Valley RWRF, and Sun City RWRF. These facilities divert treated tertiary water to reclaimed water ponds for storage and wetlands for additional treatment and percolation into the groundwater basin. The ponds are only operated six to nine months out of the year, typically from December to May or October to June.

Incidental recharge from the reclaimed water storage ponds enters the basin at an estimated recharge rate provided in Table 5. The initial recharge rates associated with each pond were provided by EMWD based on historical testing and knowledge of pond operations. It was noted that a majority of the provided rates were estimated, especially for the earlier years. Recharge rates were modified during the calibration process to create a better fit with observed data.

Due to the size of the model grid cells, pond footprints may only cover part of a cell, yet the pond is still assigned to the entire cell, artificially inflating the area of the pond. To account for this, each recharge rate is multiplied by an area factor. This is based on the actual area of the pond relative to the area of the pond represented by grid cells.

Table 5: Model Reclaimed Pond Recharge Rates

Reclaimed Pond	Area (acres)	Operation Period	Area Factor	Recharge rate (ft/day)
Alessandro	26.3	9 months/year	0.33	0.01
Case Road	21.7	9 months/year	0.42	0.10
Landmark	1.6	9 months/year	1.00	0.075
Moreno Valley RWRF	56.2	9 months/year	0.39	0.075
Perris Valley RWRF	22.4	9 months/year	0.39	0.025
San Jacinto RWRF	71.7	9 months/year	0.45	0.01
Skiland North/South	95.0	6 months/year	0.53	0.20
Sun City RWRF	67.7	9 months/year	0.47	0.06
Trumble Road	25.3	9 months/year	0.44	0.10
Watson Road	8.7	9 months/year	0.25	0.075
Wetlands	25.0	9 months/year	0.44	0.075
Winchester Pond A	43.5	9 months/year	0.51	0.035
Winchester Pond B	33.5	9 months/year	0.65	0.035
Winchester Pond C	24.4	9 months/year	0.61	0.035

A factored recharge rate was applied to all ponds outside of Perris South for the period from 1984 through 1993 because of a lack of pond operation and recharge rates for those years. All ponds in Perris South were assumed to be offline until 1993 with the exception of the Trumble Road ponds. The recharge rate factor was created using EMWD water sales values from 1984 through 1993, relative to water sales in 1993 when data for most ponds became available. For example, water sales in 1984 were 89% of water sales in 1993, so pond recharge rates in 1984 are multiplied by a factor of 0.89. Trumble Road pond recharge was reduced further by half of the reduced recharge rates to better match the observed water levels. These factors are presented in Table 6.

Table 6: Pond Recharge Rate Factors for 1984-1993

Year	Recharge Rate Factor	
	All Ponds (Not in Perris South)	Trumble Road Pond
1984	0.89	0.45
1985	0.76	0.38
1986	0.54	0.27
1987	0.70	0.35
1988	0.79	0.39
1989	0.88	0.44
1990	1.00	0.50
1991	0.90	0.45
1992	0.98	0.49
1993	1.00	0.05

2.4.2.3 Contribution from Surface Water Reservoirs

Lake Perris and Diamond Valley Lake (DVL) are both water bodies located outside the Basin GMZs (Figure 41). Underflows from Lake Perris and DVL enter the Perris North GMZ and the Hemet South GMZ, respectively, impacting the water levels in those areas and the water budget within the Basin. The underflow underneath the dam from Lake Perris into Perris North was estimated to be 3,786 AFY, where 585 AFY was due to underflow under the west abutment and 3,201 AFY was due to underflow of the subterranean stream beneath the east abutment. The underflow from east dam of DVL was estimated at 300 AFY, according to EMWD.

2.4.3 *River Recharge*

Riverbed percolation is a major component of natural groundwater recharge in the Basin. The main sources of river recharge are:

- San Jacinto River
- Bautista Creek
- Perris Valley Storm Drain (Perris Drain)

The San Jacinto River flows from Canyon through Upper Pressure, Lower Pressure, Lakeview, and Perris South GMZs. Due to limited streamflow, the majority of San Jacinto River recharge occurs in the Canyon and Upper Pressure GMZs. The San Jacinto River flow data is measured at three different USGS stream gauge locations: the Cranston Gauge in Canyon (USGS 11069500), the State Street Gauge in Upper Pressure (USGS 11070150), and the Ramona Expressway in Lakeview (USGS 11070210), as seen in Figure 41. San Jacinto River flows are only observed downstream at the gauge in Lakeview during wet years. Flows and estimated flows during the study period for the various reaches are provided in Figure 42. The Cranston Gauge was not operational from 1992 to 1996. Values used to represent the missing data during this time were obtained from the Joel R. Guay report, *Rainfall-Runoff Characteristics and Effects of Increased Urban Density on Streamflow and Infiltration in the Eastern Part of the San Jacinto River Basin, Riverside County, California*. Data at the Ramona Expressway gauge is available starting in 2000.

Parts of the San Jacinto River bed were also used for artificial recharge through diversions to recharge ponds operated by EMWD and Lake Hemet, as discussed in the previous section.

Bautista Creek enters the Basin through the southern portion of Upper Pressure before joining with the San Jacinto River along the boundary of Upper Pressure and Canyon. The majority of Bautista Creek that flows through the Basin boundary is concrete lined and has very little leakage. Some of Bautista Creek streamflow is recharged in in a large flood plain in the southernmost part of Upper Pressure and any excess flow continues into the San Jacinto River.

Perris Drain transects through Perris North and into Perris South before discharging into the San Jacinto River. It drains an approximately 38 square-mile area which includes the City of Perris, City of Moreno Valley, and the March Air Reserve Base (MARB). Generally, the Perris Drain is an earthen channel, except for a portion north of MARB where it is concrete lined. It was assumed that the channel recharged an average of 300 AFY in the Perris North GMZ.

It should be noted that Salt Creek was included in the model, but had no streamflows. In general, little to no flow exists in Salt Creek, but the reach can act as a drain when water levels increase above the streambed invert elevations.

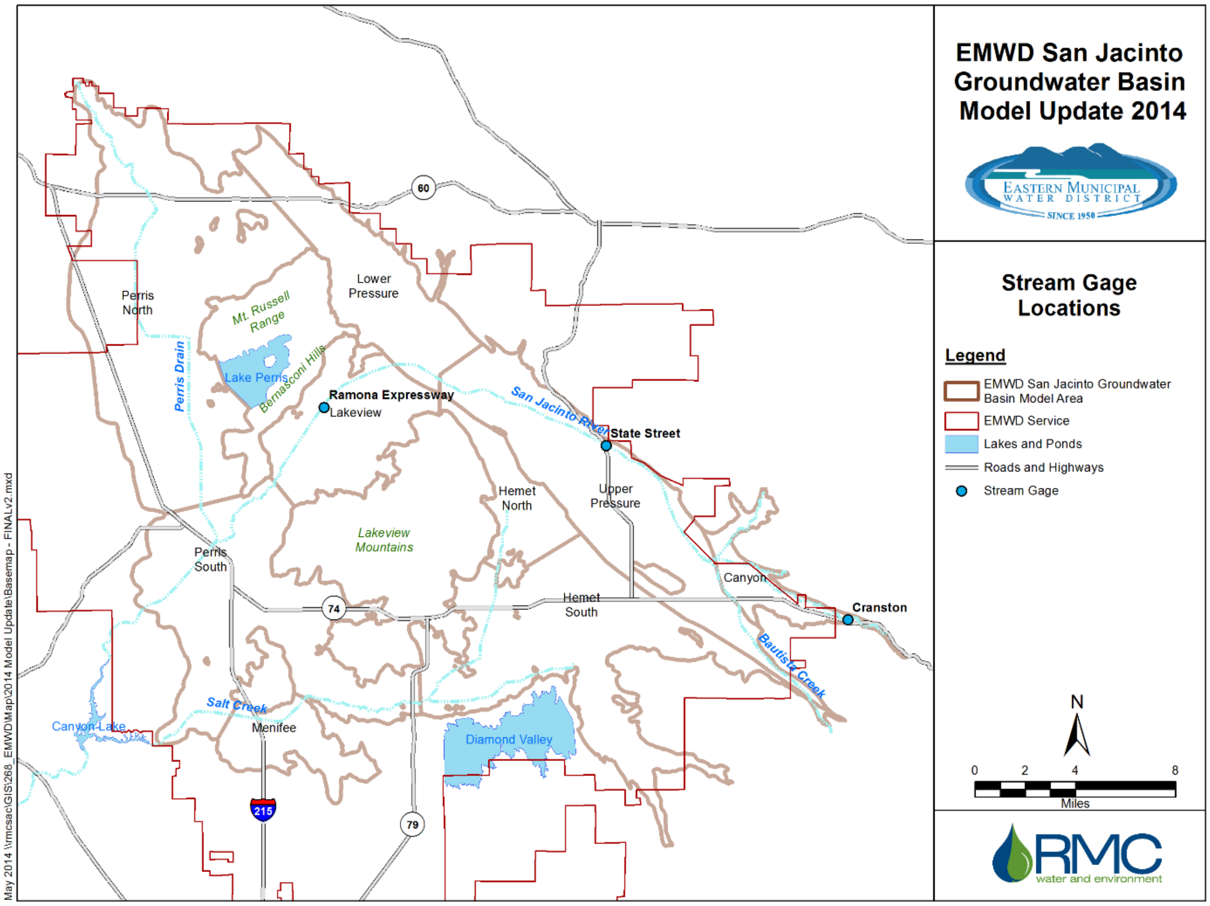


Figure 41: USGS Stream Gauge Locations in the Basin

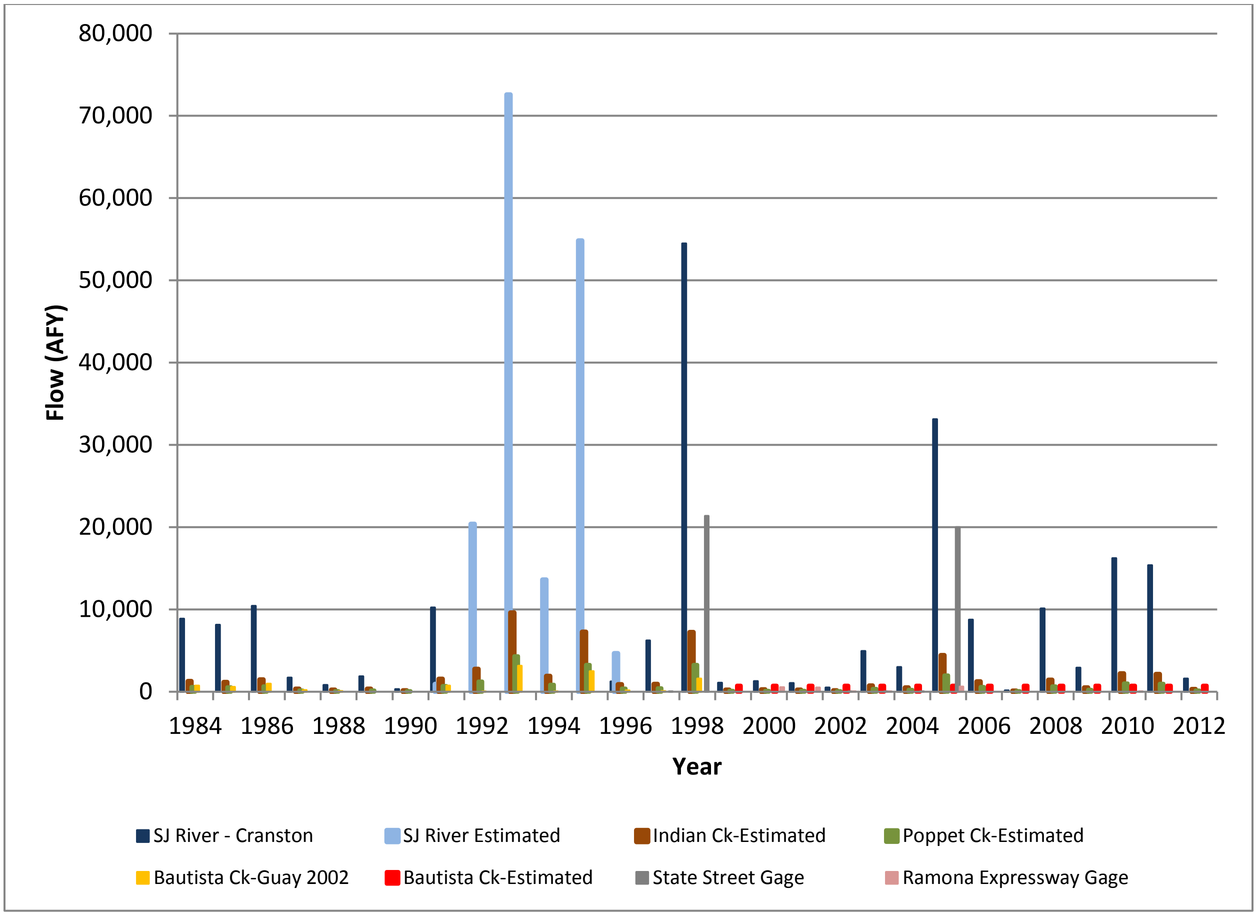


Figure 42: Annual Streamflows – Measured and Estimated

2.4.4 *Mountain Front Recharge*

While the Basin is a closed groundwater basin with no significant natural subsurface outflows, it does receive additional inflows through local runoff from the adjacent areas, referred to as mountain front recharge. This local runoff is not gauged, but is an important component of the overall water budget for the Basin. Preliminary estimates of mountain front inflow were obtained from the SJFTM-2002. These estimates were refined during the calibration of the SJFM-2014.

2.5 Groundwater Outflow

The main groundwater outflow from the San Jacinto Groundwater Basin in recent decades has been production by municipal, agricultural and private wells. More recently, brackish groundwater is being extracted as part of EMWD Desalination Program. The groundwater outflows are described in the following sections.

2.5.1 *Groundwater Production – Potable Municipal, Agricultural, and Private Wells*

Groundwater production from pumping wells is the only major source of outflow in the model. There are 453 production wells within the active model area. These wells are used to fulfill water demands for irrigation, industrial, and domestic water use. City and municipal wells in the area have flow gauges that record pumping rates and time of operation, data that is tracked by EMWD and other local agencies as part of the groundwater management plan. Some irrigation wells are also fitted with flow gauges, allowing for a similar dataset to be collected. For irrigation wells that do not have flow gauges, an estimate of groundwater production is made by the agencies based on crop type, irrigation efficiency, potential evapotranspiration, and the acreage irrigated.

Most of the municipal water wells owned and operated by EMWD, LHMWD, Cities of San Jacinto and Hemet, as well as private pumpers, are concentrated in the southeast section of the Hemet-San Jacinto Groundwater Management Area in the Hemet South, Upper Pressure and Canyon GMZs. Additionally, EMWD owns and operates numerous wells in Perris North and Perris South, and the California Department of Fish and Wildlife owns several wells in the Lower Pressure GMZ. A number of production wells found in the Basin are privately owned wells. In general, private wells are owned by agricultural growers and are used to supply irrigation water. Figure 43 shows the location of the production wells within the Basin and Table 7 provides the number of production wells per GMZ.

Table 7: Number of Production Wells by GMZ

GMZ	Number of Wells
Perris North	42
Perris South	26
Menifee	13
Lower Pressure	22
Lakeview	37
Hemet North	50
Hemet South	74
Upper Pressure	160
Canyon	29
Total	453

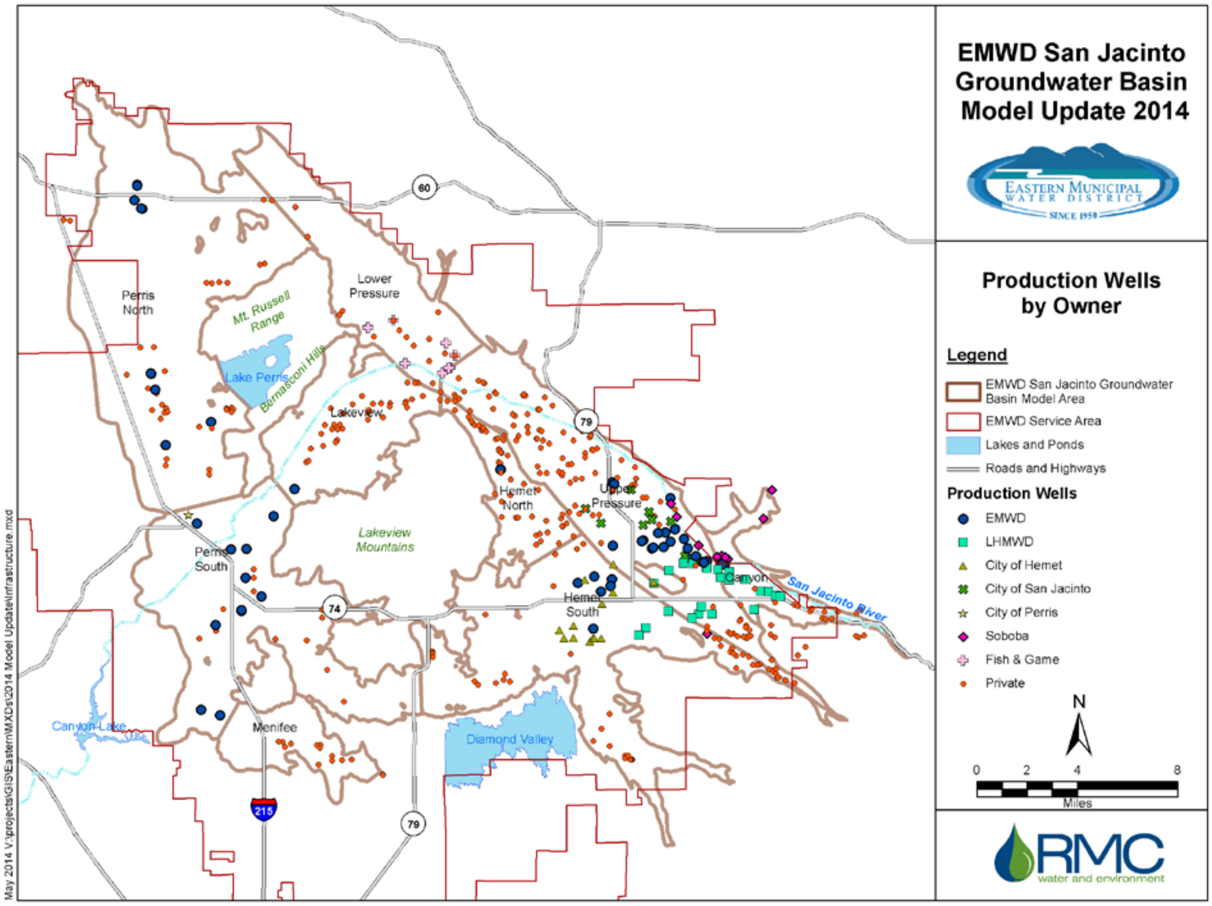


Figure 43: Production Wells within the Basin

2.5.2 *Groundwater Production – Brackish Municipal Wells*

The EMWD Desalination Program produces potable water at the Perris and Menifee Desalters, which are supplied with brackish groundwater pumped from municipal brackish water wells located in Perris South and Lakeview, as shown in Figure 44. The figure also shows the expanse of the brackish water area, which covers a majority of Perris South and Menifee along with portions of Perris North, Lakeview and Hemet South. The elevated total dissolved solids (TDS) levels in the groundwater produced by the municipal brackish water wells are treated by reverse osmosis. The resulting brine is exported from the basin. At the time of the report, there are 12 municipal brackish water wells owned and operated by EMWD, though not all are operational.

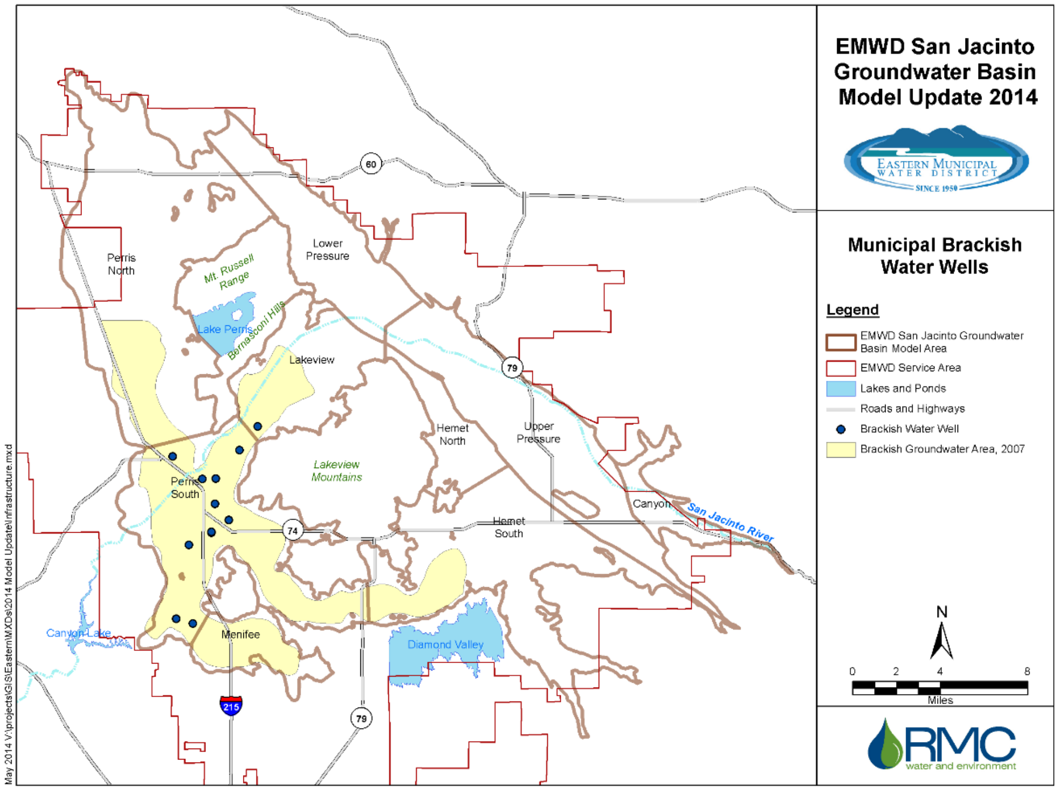


Figure 44: Location of Municipal Brackish Water Wells

Figure 45 presents the groundwater production quantities in the Basin during the study period by GMZ. Locations of active production wells every five years from 1985 to 2010 are shown in Figure 46 to Figure 51. The high pumping areas in the model can be identified in Upper Pressure, the Cienega well area of Canyon and Hemet South.

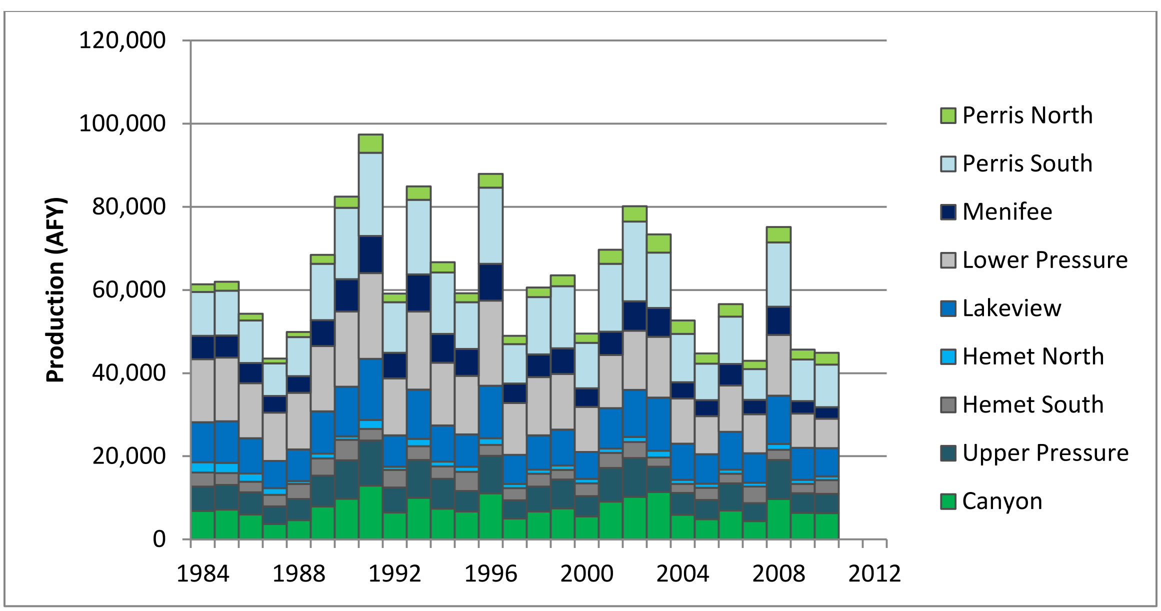


Figure 45: Groundwater Production in the Basin by GMZ

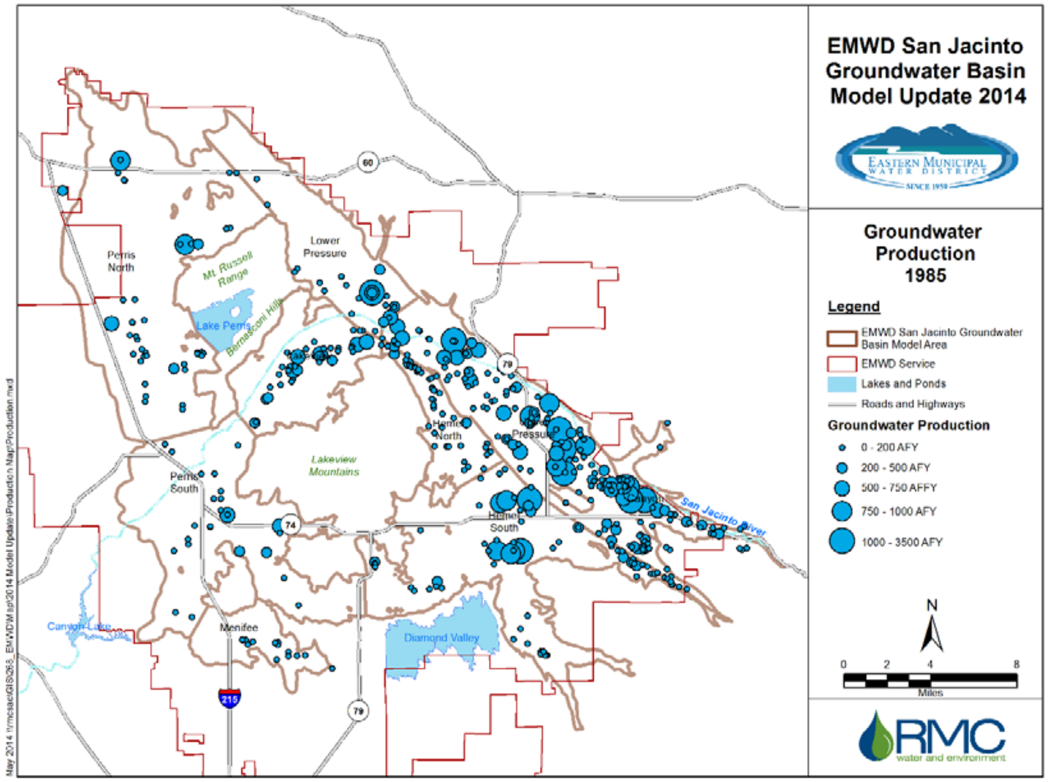


Figure 46: Location and Production Rates of Groundwater Production Wells in 1985

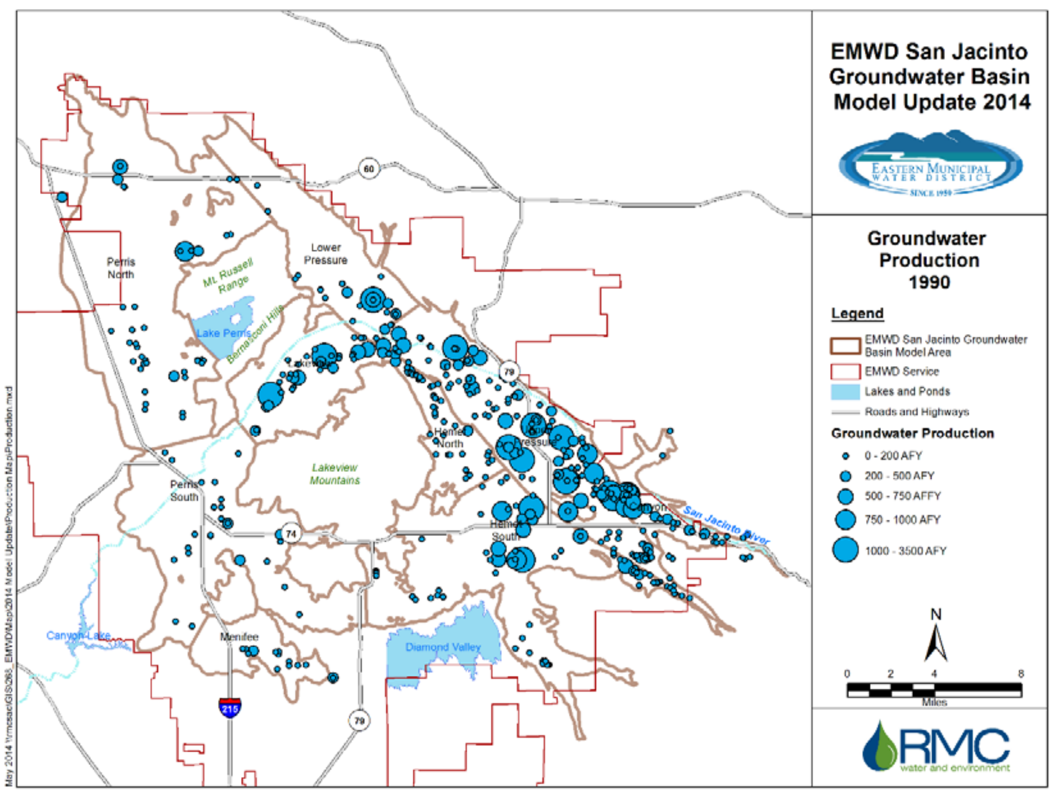


Figure 47: Location and Production Rates of Groundwater Production Wells in 1990

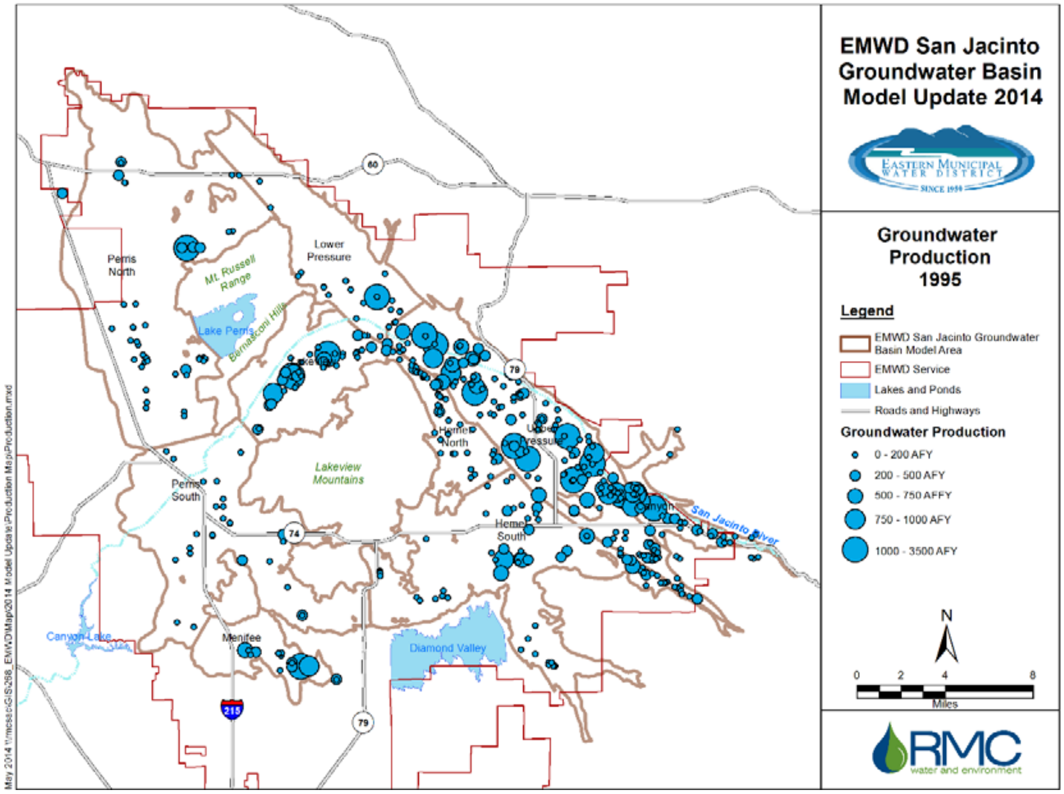


Figure 48: Location and Production Rates of Groundwater Production Wells in 1995

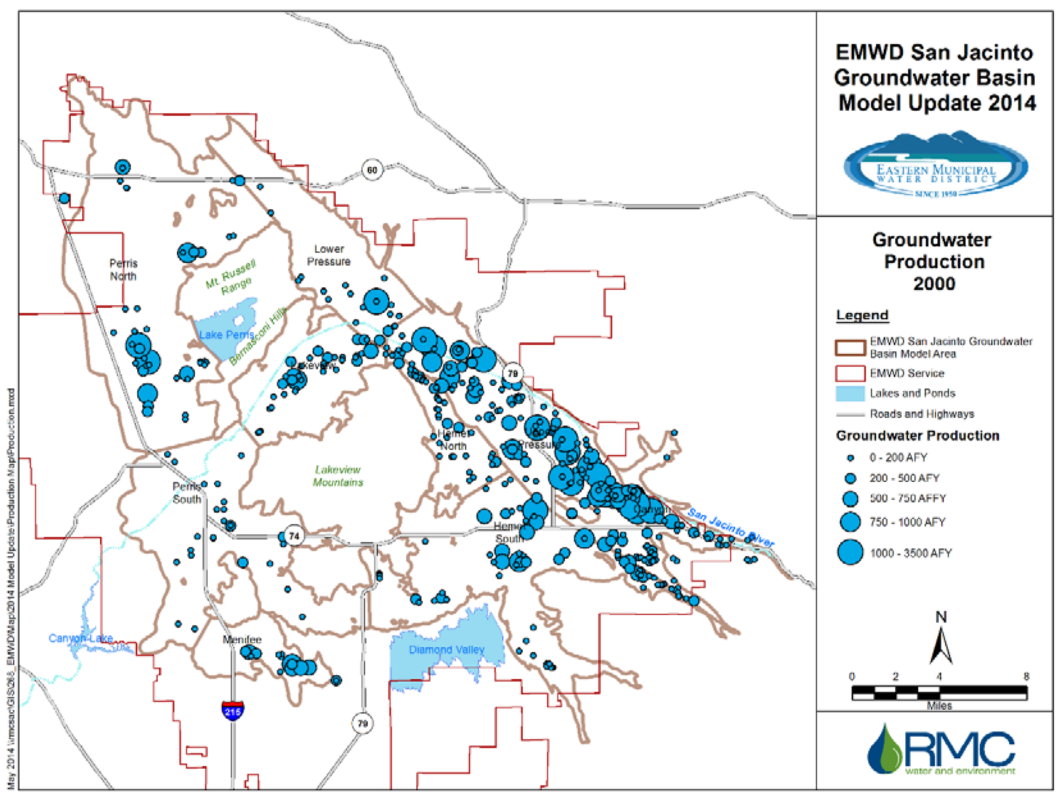


Figure 49: Location and Production Rates of Groundwater Production Wells in 2000

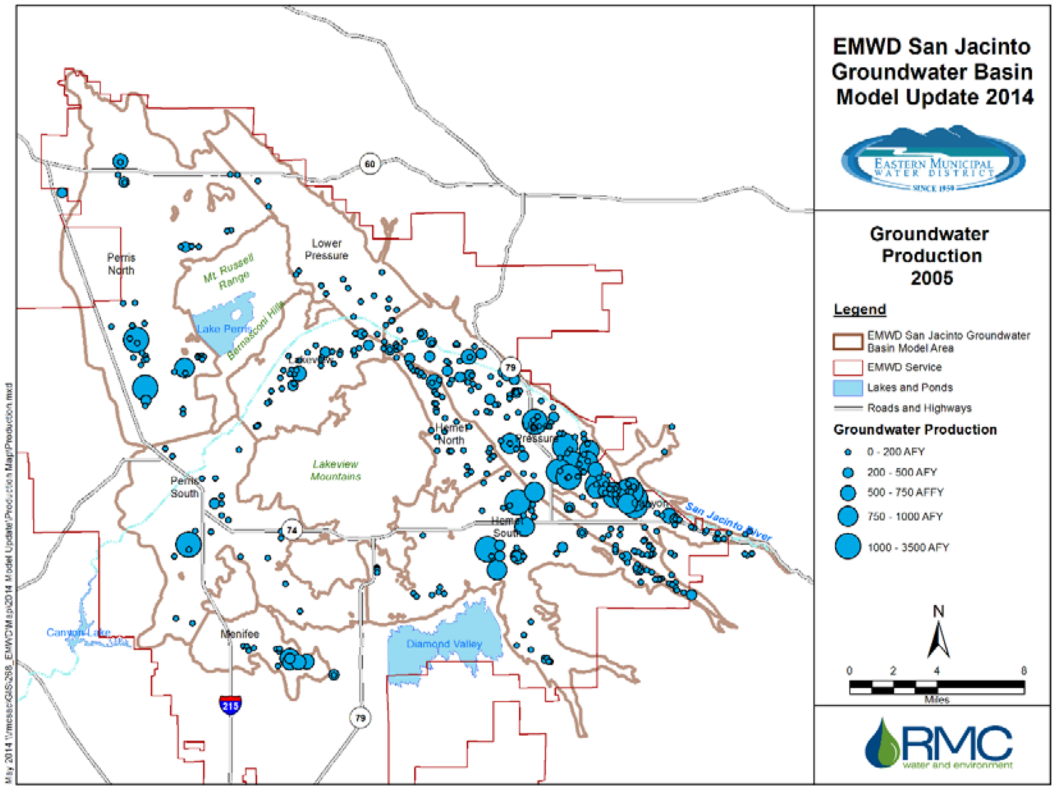


Figure 50: Location and Production Rates of Groundwater Production Wells in 2005

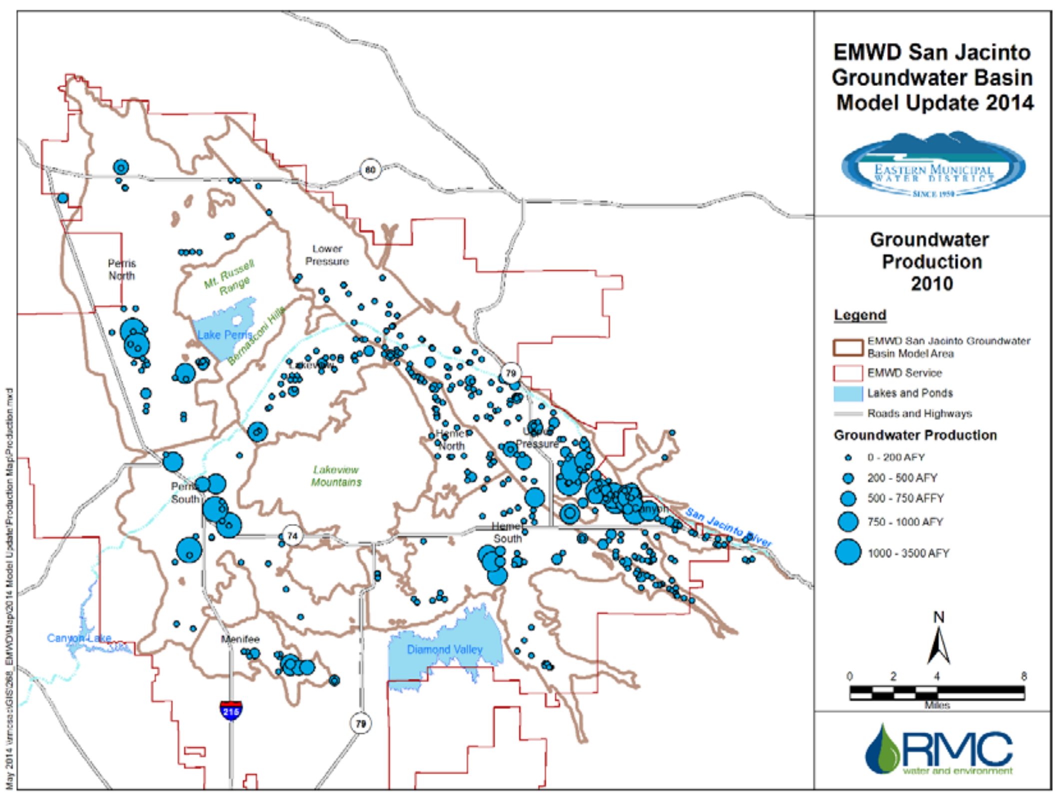


Figure 51: Location and Production Rates of Groundwater Production Wells in 2010

Section 3 Groundwater Flow Model Development

The San Jacinto Groundwater Flow Model Update - 2014 (SJFM-2014) is a saturated groundwater flow model that was constructed using the U.S. Geological Survey (USGS) groundwater flow code MODFLOW-NWT (Niswonger, et al., 2011), a Newton formulation for MODFLOW-2005(Harbaugh, 2005). Groundwater Modeling Systems (GMS) was used as the pre- and post-processing program.

A summary of the SJFM-2014 features are listed in Table 8. These features are discussed further in the remainder of the section.

Table 8: Features of the San Jacinto Groundwater Flow Model Update - 2014

Feature	SJFM-2014	Notes
Simulated Systems	Saturated Groundwater Flow	
Model Platform	GMS 10, MODFLOW-NWT	
Calibration Period	29 years (Calendar Year: 1984-2012)	
Stress Period (SP)	1 month	
Time Steps	Daily	
Model Layers	4 in Lower Pressure and Upper Pressure, 3 in other GMZs	
Grid Resolution	Uniform 500’x500’ cells (353 rows, 206 columns)	
Grid Rotation	50° counterclockwise rotation	
Active Cells	50,000+ active cells across all 4 layers	
San Jacinto River	Streamflow Routing Package (SFR)	
Recharge Estimation	Recharge Package (RCH)	A recharge pre-processor was developed to estimate recharge rates at each model cell based on land use (1999, 2003, 2010) and soil properties
Faults	Horizontal Flow Barrier Package (HFB)	
Leaky Faults	Drain Return Package (DRT)	
Mountain Front Recharge	WEL – simulates specified flux to individual cells	
Reclaimed Water Ponds	Recharge Package (RCH)	
Recharge Ponds	Recharge Package (RCH)	
Groundwater Production	WEL - well package	
Initial Head	1984 heads from 2002 Model	Adjusted based on available hydrographs
Aquifer Parameters	2002 Model calibrated aquifer parameters used as initial estimates	Adjust during calibration

3.1 Model Grid

The model grid consisted of 353 rows and 206 columns, or 72,718 cells per model layer. Each grid cell was spaced at 500 x 500 feet. The relatively fine grid spacing was required to follow the irregular external and internal boundaries of the San Jacinto Groundwater Basin. The grid was rotated 50 degrees counterclockwise from north, approximately aligning the column directions with the Casa Loma Fault. The coordinates of the lower left corner of the grid in NAD 83 State Plane Zone 6 were Easting (X) 6,333,660.04 feet and Northing (Y) 2,132,694.37 feet. The extent of the model grid is shown in Figure 52.

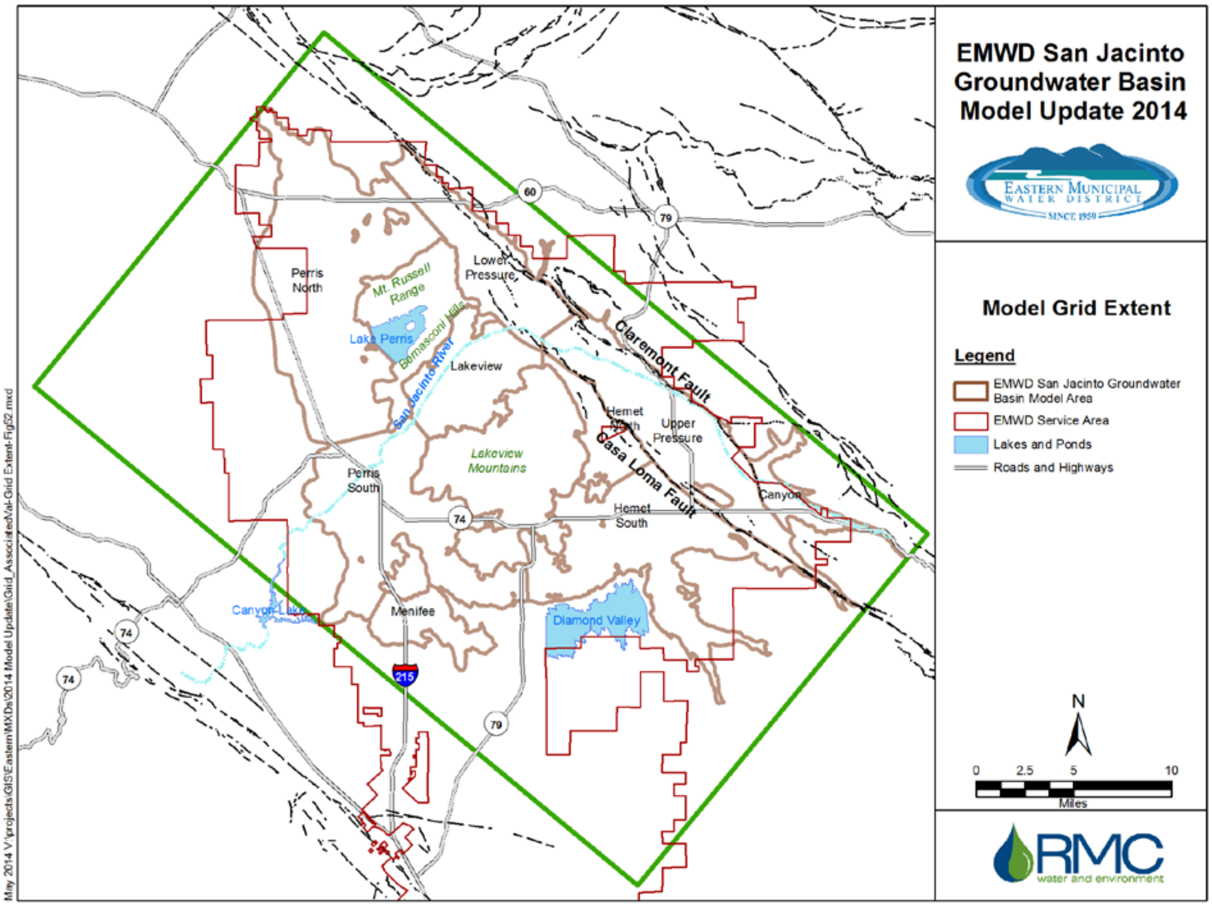


Figure 52: Model Grid Extent

3.2 Model Layers

Three to four model layers were identified in the majority of the Basin, based on analysis using driller's logs, geophysical logs, well construction information, groundwater elevation data, and groundwater quality data as discussed in Section 2, Appendix A, and associated cross sections. The approximate layering is represented on the cross sections discussed previously. Active cells for each model layer are shown in Figure 53 through Figure 56. Model layers along several model cross sections are shown in Figure 57 and Figure 58. The purple highlighted layer represents Layer 1.

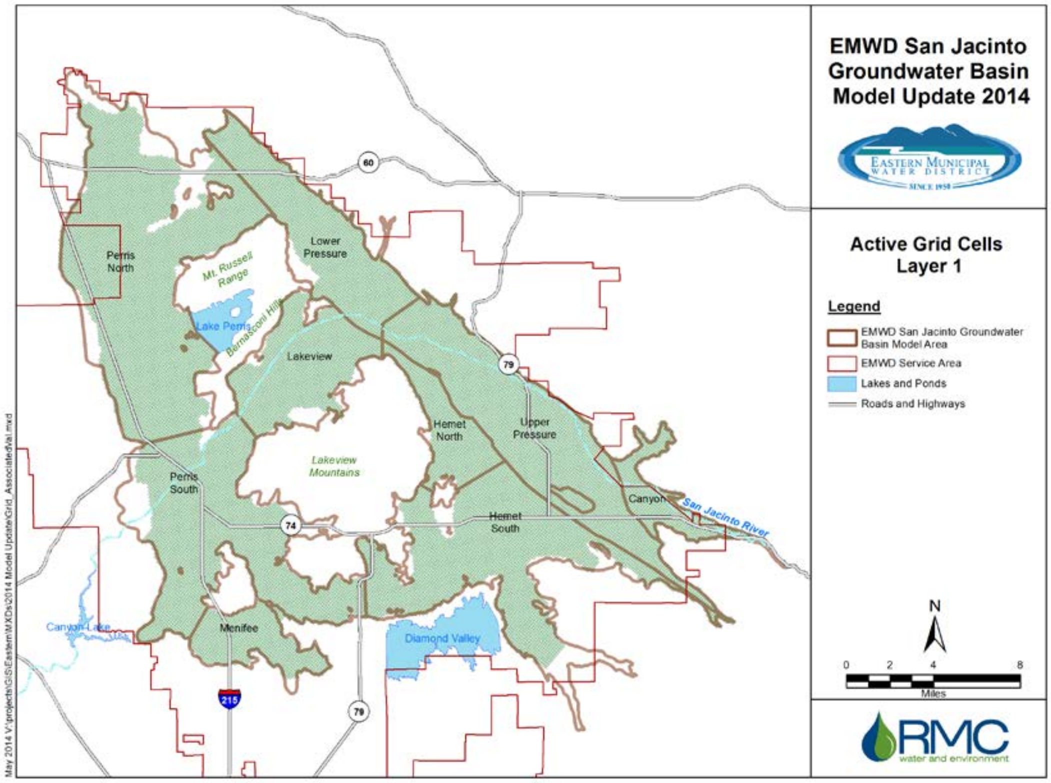


Figure 53: Active Grid Cells in Layer 1 (Green area represent the active model cells)

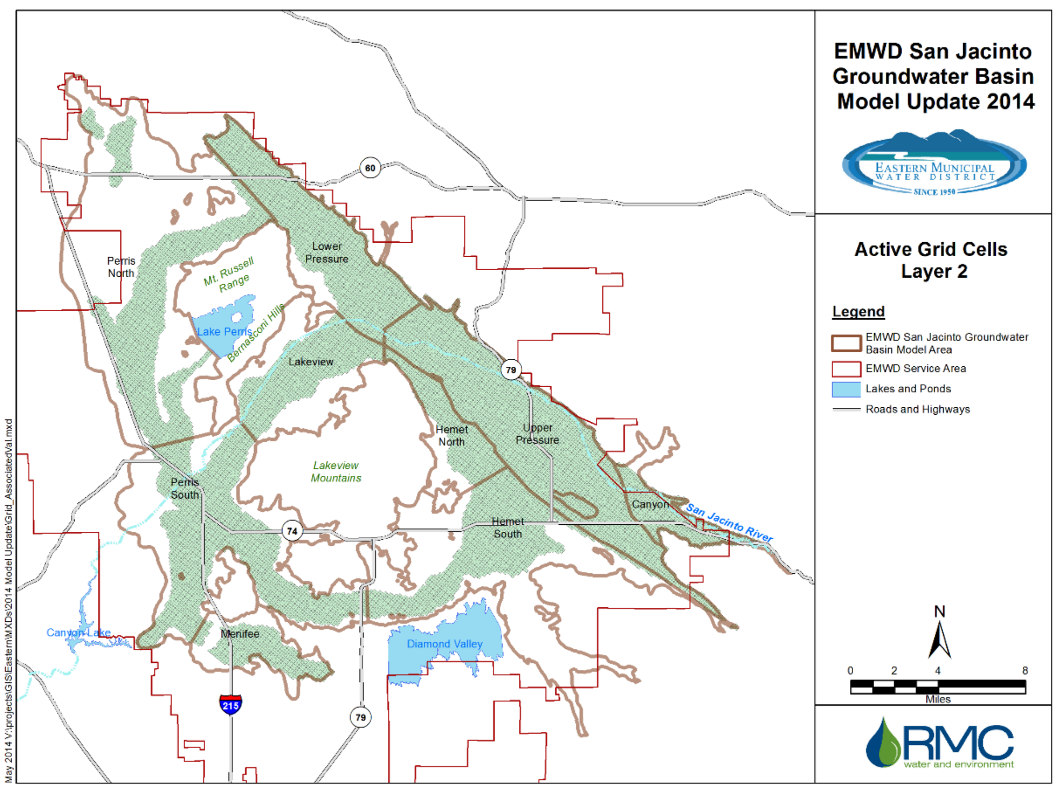


Figure 54: Active Grid Cells in Layer 2 (Green area represent the active model cells)

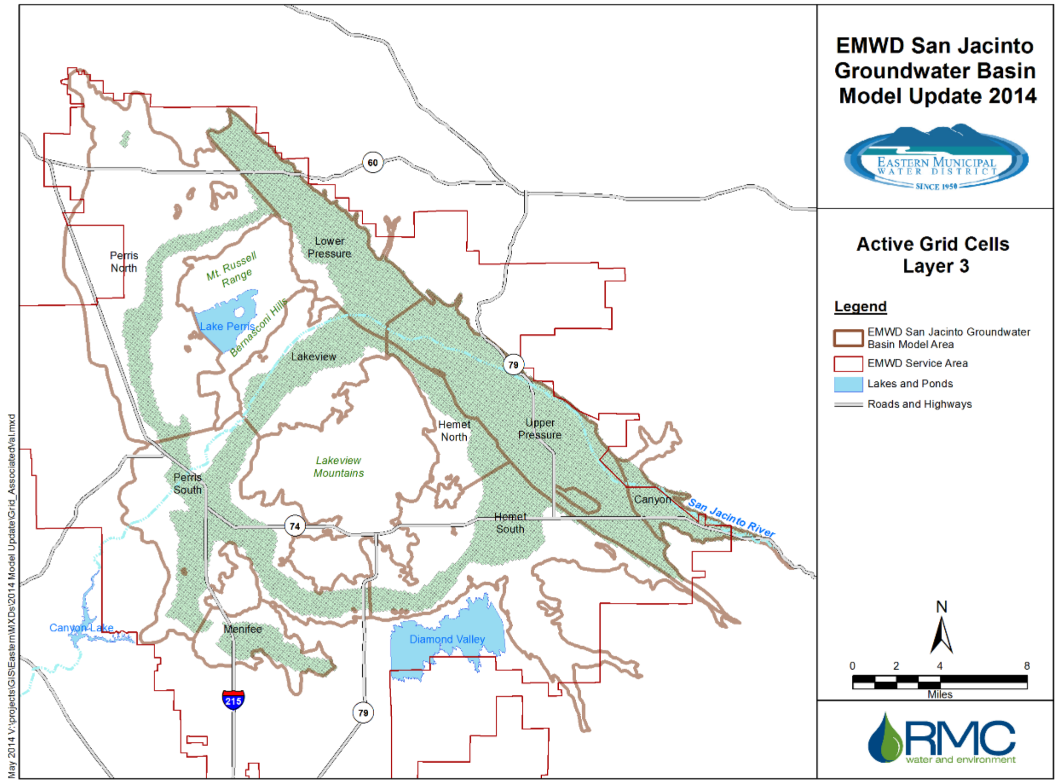


Figure 55: Active Grid Cells in Layer 3 (Green area represent the active model cells)

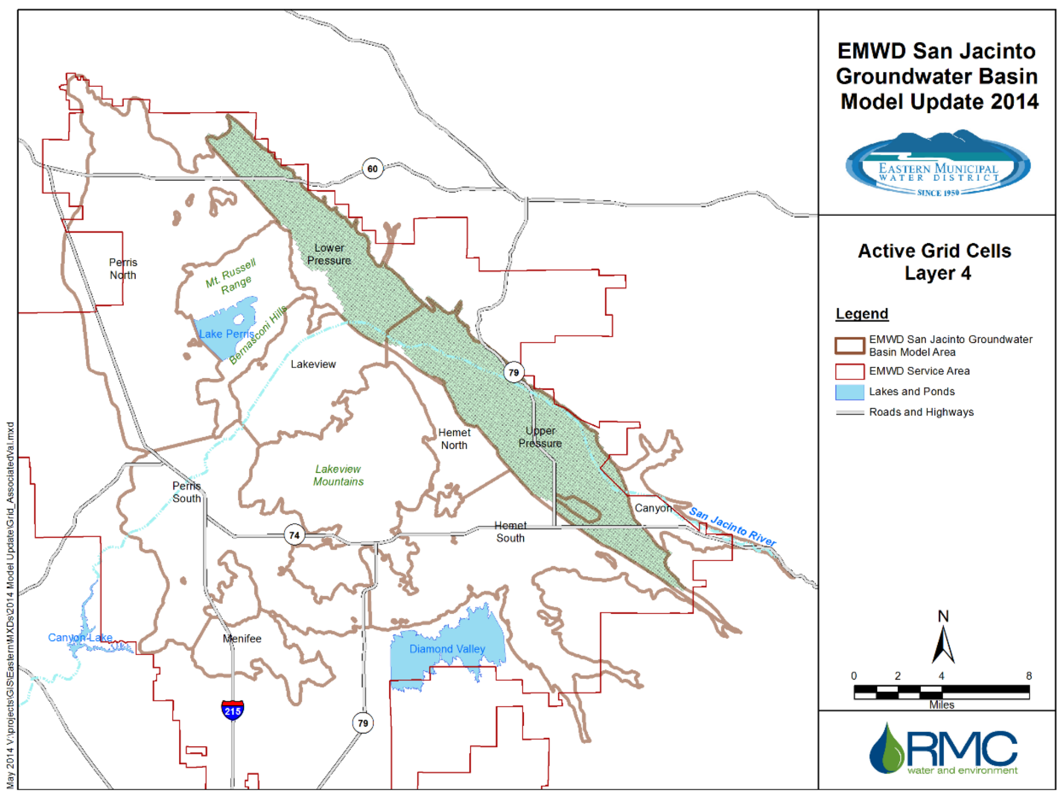


Figure 56: Active Grid Cells in Layer 4 (Green area represent the active model cells)

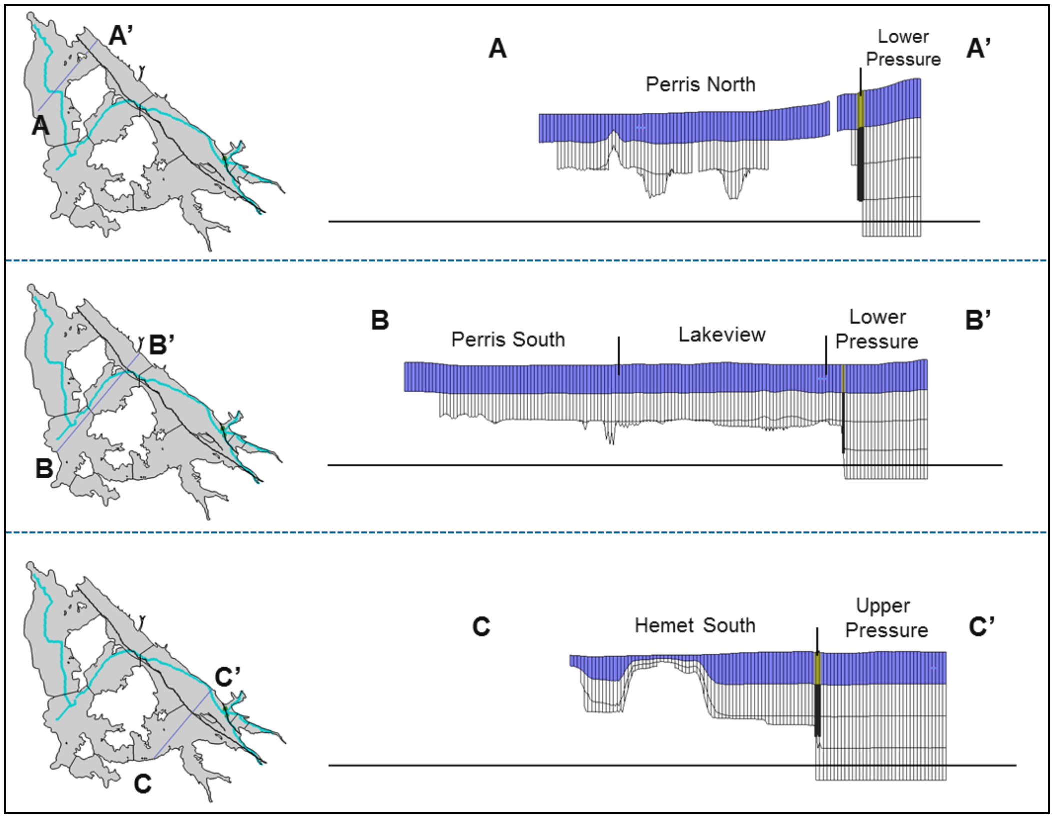


Figure 57: East-West Cross-Sections of Model Layers

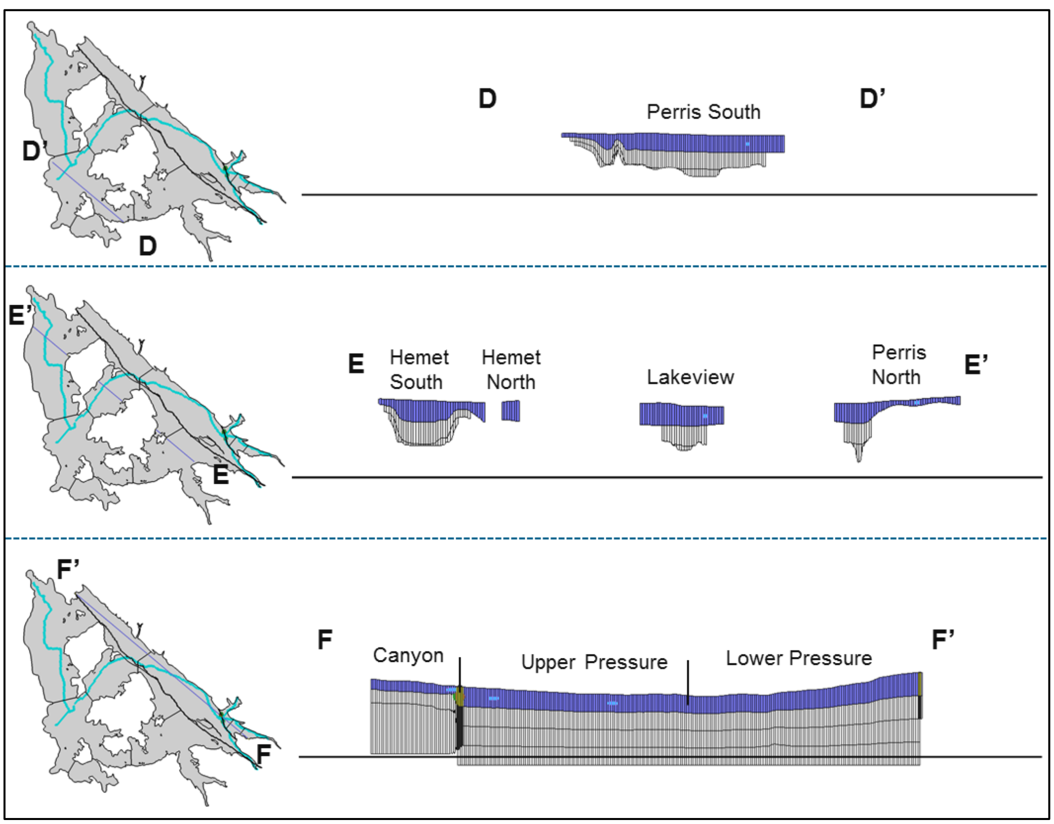


Figure 58: North-South Cross-Sections of Model Layers

Four layers were identified in the Upper Pressure and Lower Pressure GMZs. The topmost layer (Layer 1) was almost completely dry, and extended from ground surface to a depth of approximately 200-500 feet. The second hydrogeologic layer, Layer 2, marked the beginning of the major production zone in these GMZs, and extended from the bottom of the topmost hydrogeologic layer to a depth of approximately 800 – 900 feet below ground surface. The major production zone continued into Layer 3, which reached a depth of approximately 1,300 feet, marking the beginning of the Bautista formation and the end of the main production zone. The final hydrogeologic layer, Layer 4, is comprised of materials from the Bautista formation and reached the bottom extent of the model which was set at roughly 1,800 feet below ground surface.

In the western portion of the Basin (consisting of the Perris North, Perris South, Hemet North, Hemet South, Lakeview and Menifee GMZs), a three layer aquifer system was indicated by the hydrogeologic layering. The topmost layer (Layer 1) extended to an approximate depth of 300 feet and contained mostly fresh water. Layer 2 was brackish in some areas and extended to roughly 600 feet below ground surface. Layer 3 mostly contained freshwater, and varied significantly in thickness due to bedrock relief. Anecdotally, previous EMWD staff and USGS staff conveyed that there are some indications that Layer 3 likely contains clay-rich supersaturated groundwater in portions of the western Basin; possibly limiting its utility as a production zone (EMWD, 2015).

Three hydrogeologic layers were also identified In the San Jacinto Canyon GMZ. The topmost layer, Layer 1, extended from ground surface to a depth of approximately 200-300 feet. Layer 2 extended from the bottom of the topmost hydrogeologic layer to a depth of nearly 600 feet. These top two layers were the primary production zones and high producing wells were typically screened in these layers. Layer 3 included lower permeability materials, potentially including more consolidated alluvium and the Bautista Formation. Layer 3 reached the bottom extent of the model, which was set at roughly 1,600 feet below ground surface, based on the depths of deepest wells in the basin. Outside of the main portion of the basin, a shallower Layer 1 extended into the Poppet Creek area.

All layers were set to be convertible, where cells can convert from confined to unconfined conditions, depending on the water levels. After each iteration, the model checked to determine whether head in the layer was above or below the elevation of the top of the layer. If head in the layer was higher than the elevation of the top of the layer, the layer was assumed to be confined. If head in the layer was less than the elevation of the top of the layer, the layer was assumed to be unconfined (Anderson and Woessner, 2002).

3.3 Model Faults and Geologic Structures

As discussed in Section 2.3.2, there are several faults that influence the groundwater flow in the basin. The main faults in the Basin that were modeled are the Casa Loma Fault, the Claremont Fault, and the Park Hill Fault. Other representations of local geologic structures were included in the model as "modeling constructs". These include two in Canyon and one spanning across the Lower Pressure and Upper Pressure boundary. The modeled faults are present in every layer.

Some faults were modeled as partial barriers using the MODFLOW Horizontal Flow Barrier Package (HFB), allowing some groundwater to flow through. The fault leakance was input into the model as the hydraulic characteristic. The hydraulic characteristic is the barrier hydraulic conductivity divided by the width of the barrier, regardless of the layer type or flow used; thus, layer thickness is always used in calculating the contribution to the conductance terms (Harbaugh, 2000). The hydraulic characteristic for each fault with general direction of flow is provided in Table 9. The locations of the modeled faults are presented in Figure 59.

Table 9: Hydraulic Characteristic Values for Modeled Faults with General Direction of Flow

Geologic Structure	General Direction of Flow Across Geologic Structure	Hydraulic Characteristic
Casa Loma Fault	Lower Pressure to Perris North	0.0005
Casa Loma Fault	Hemet South to Upper Pressure	0.0002
North Canyon Construct Layer 1	Canyon Zone 2 to Canyon Zone 1	0.01
North Canyon Construct Layer 2	Canyon Zone 2 to Canyon Zone 1	0.001
North Canyon Construct Layer 3	Canyon Zone 2 to Canyon Zone 1	0.0001
South Canyon Construct	Canyon Zone 3 to Canyon Zone 2	0.1
Claremont Fault	Canyon Zone 1 to Upper Pressure	Drain Package at 40-45 feet below ground surface with conductance of 1,000 ft^2/day
Park Hill Fault	No flow across structure	No Flow Boundary
LP-UP Construct	No flow across structure	No Flow Boundary

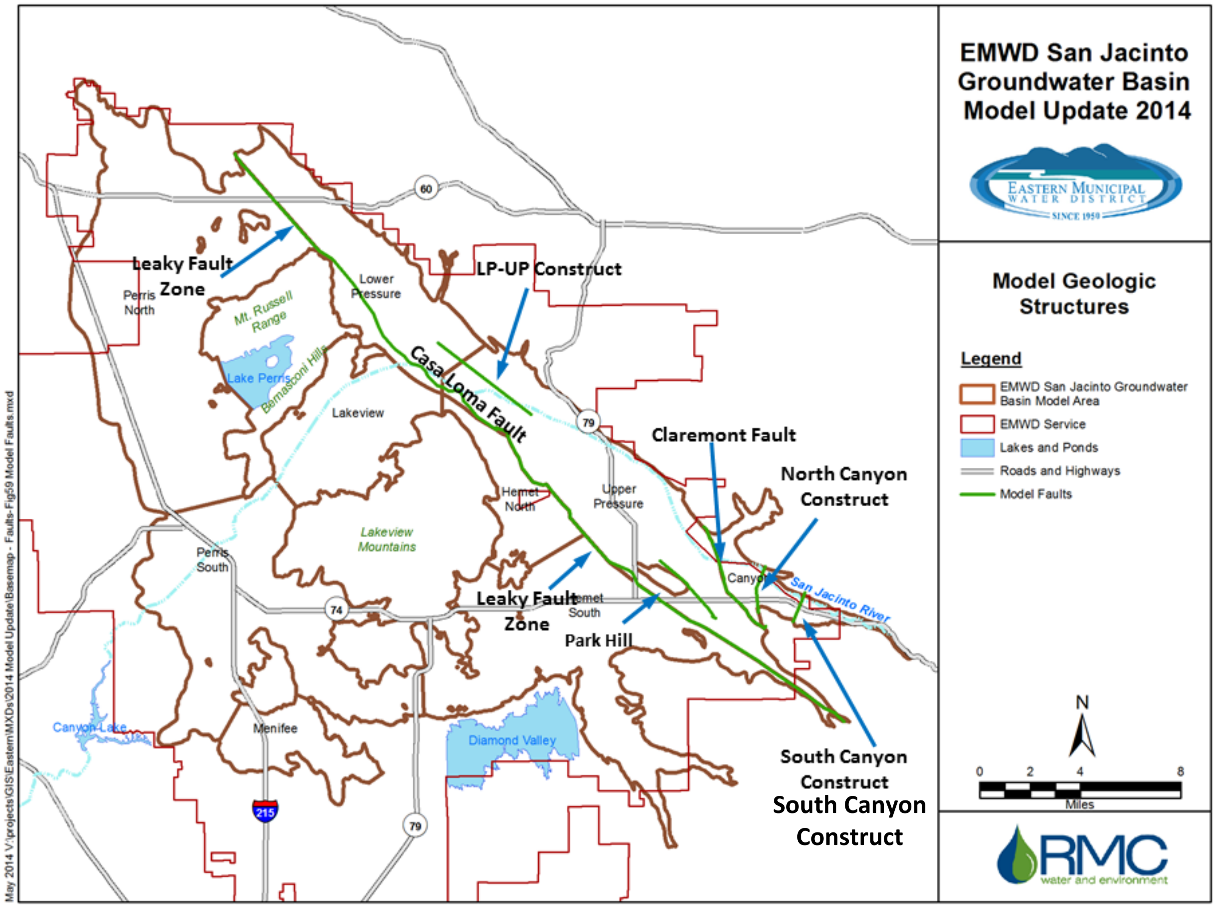


Figure 59: Modeled Faults in the SJFM-2014

3.3.1 *Casa Loma Fault*

For modeling purposes, the Casa Loma Fault spans the western boundary of Lower Pressure and Upper Pressure GMZs. In general, the Casa Loma Fault was modeled as an impermeable, no flow barrier, except in two locations: between Perris North and Lower Pressure and between Hemet South and Upper Pressure. Hydraulic characteristics of the partial fault are provided in Table 9.

3.3.2 *Claremont Fault*

The Claremont Fault was modeled as the boundary between Upper Pressure and Canyon GMZs. This fault was modeled as an impermeable, no-flow barrier although significant flows across the fault have been recorded when water levels are within 40-60 feet of ground surface. To model these instances, a MODFLOW drain package (DRT) was employed at elevations 40 to 45 feet below ground surface. The drains have a conductance of 1,000 ft^2/day.

3.3.3 *Park Hill Fault*

The Park Hill Fault spans the Park Hill area and is modeled in the SJFM-2014 as an impermeable barrier.

3.3.4 *Other Model Constructs*

In order to model the system with a numerical model, a number of “constructs” or model representations were employed to generate the observed conditions in the aquifers. Besides known faulting in the model, other hydrogeologic structures were noted to be present in the model area. Localized changes in observed water levels for wells in close proximity indicate the possibility of a geologic structure in the area. These structures were simulated in the model as faults using the HFB package. These areas include the LP-UP Construct, the North Canyon Construct, and the South Canyon Construct.

3.3.4.1 LP-UP Construct

The LP-UP Construct was simulated based on a historical groundwater depression in the southwestern Lower Pressure and northwestern Upper Pressure area presented in historical groundwater contours in EMWD annual reports. The construct spans northwest to southeast across the Lower Pressure and Upper Pressure boundary, helping simulate the observed groundwater depression and groundwater divide. The LP-UP Construct is an impermeable, no-flow barrier.

3.3.4.2 Canyon Constructs

The northern Canyon GMZ and southern Canyon GMZ Constructs were modeled as leaky barriers. The northern Canyon Construct had a decreasing hydraulic characteristic, dropping from 0.01 to 0.0001 from Layer 1 down to Layer 3, as seen in Table 9. The southern Canyon Construct hydraulic characteristic was consistent throughout all layers. A more detailed explanation of the basis for these constructs may be found in the Canyon GMZ Geology Section above in Section 2.3.3.8.

The Canyon constructs divide Canyon into three segments, or zones. These zones are labeled from north to south, with Zone 1 as the northern most zone and Zone 3 as the southernmost zone.

3.4 Simulation Time Period

The simulation time period of the SJFM-2014 spanned 29 years from January 1984 to December 2012. The later years in the simulation time period provided a more robust dataset relative to earlier years, because well monitoring and data collection became more frequent and readily available. The simulation time in the model was divided into stress periods and time steps. The stress periods are time periods during which the aquifer stresses, such as pumping and recharge rates, remain constant. A stress period of one month with daily time steps was used for the SJFM-2014, equating to a total of 348 stress periods in the simulation time period.

3.5 Aquifer Parameters

The 2002 Model served as a basis for the initial set of aquifer parameters in the model. These parameters were adjusted, via trial and error, throughout the calibration process to best fit the simulated model heads and the observed data in the SJFM-2014. The aquifer parameters are described below and the calibrated aquifer parameters are presented in Section 4.5.

3.5.1 *Horizontal Hydraulic Conductivity*

The horizontal hydraulic conductivity (K_h) from the 2002 model incorporated information from lithologic boring logs, specific capacity tests, aquifer test and prior calibrated K_h values generated from prior groundwater models. These values were used as the basis for the SJFM-2014 K_h parameters at the beginning of calibration. The K_h values were recalculated based on changed layer thicknesses and used as initial conditions for the model update. The resulting K_h values are presented in Section 4.5.1.

3.5.2 *Vertical Hydraulic Conductivity*

Vertical Hydraulic Conductivity (K_v) has the same spatial distribution as horizontal conductivity. The K_v values were recalculated based on changes in K_h and used as initial conditions for the model update. The K_v values were typically 10-13% of the K_h values established during calibration of the SJFM-2014 with some exceptions in the Upper Pressure. The resulting K_v values are presented in Section 4.5.1

3.5.3 *Specific Yield*

Specific yield is used to represent the storage in unconfined cells, typically in Layer 1. Specific yield is defined as the volume of water drained from a unit volume of porous saturated material due to gravity. It represents the volume of water released or taken into storage due to fluctuations in the water table. The 2002 Model values were used as initial specific yield parameters and were adjusted during the model calibration process. Additionally, new pump test data was reviewed and determined that the 2002 numbers were still representative of the data set. The new data validated the previous values used as initial conditions.

3.5.4 *Specific Storage*

Specific storage is used for storage in confined cells, when head values are above the top of the cell elevation. Specific storage is the volume of water released or taken into storage per unit volume of aquifer per unit change in head. The 2002 Model values were used as initial specific yield parameters and were adjusted during the model calibration process. Additionally, new pump test data was reviewed and determined that the 2002 numbers were still representative of the data set. The new data validated the previous values used as initial conditions.

3.6 Groundwater Production Layer Assignments

Most pumping wells were screened in or across Layers 1 and 2. In Upper Pressure, most wells were screened across lower layers, especially in the intake area. Of the 453 wells in the model area, only 217 wells had available screen data. The remaining wells were assigned to layers based on pumping rate and GMZ. A majority of the wells without screening data were agricultural wells, which are typically shallow wells found in Layer 1 and occasionally in Layer 2. As a result, wells without screening information were either assigned to Layer 1 or Layer 2. The layer assignment criteria is listed in Table 10.

Table 10: Production Well Layering Assignment Criteria

Layer	Criteria
1	Wells with no screen data (not in Upper Pressure): • Agricultural/Irrigation wells with average pumping < 300 gpm • Non-Agricultural wells with average pumping < 300 gpm
2	• Upper Pressure/Intake Wells with no screen data • Wells with no screen data (not in Upper Pressure) with average pumping > 300 gpm
3	No wells without screen data were assigned to Layer 3
Multiple	Wells with screen data

3.7 Distributed Recharge

The Basin received recharge flows from distributed sources of applied water components including water sales, recycled water sales, irrigation return flow, and natural recharge from rainfall infiltration.

The quantity of recharge from distributed sources was dependent on a) the percentage of pervious land surface and b) the soil drainage properties. These two properties were used in this study for estimation of distributed recharge. Based on these two properties, a Percolation Factor property was developed for estimating the recharge flows from distributed sources through GIS analysis of the input data. These properties and the methodology for estimating recharge from distributed sources are presented in the following subsections.

3.7.1 *Percentage of Pervious Land Surface*

The percentage of pervious land surface was used to determine the percentage of rainfall and applied water that is likely to make it to pervious ground cover and soil and percolate to the saturated zone. The percentage of pervious land surface for the four general land use categories of agriculture, commercial, residential, and vacant were estimated based on Impervious Surface Coefficient (ISC) values. ISC is based primarily on an estimate of impervious groundcovers (i.e. roads, roof tops, etc.) that have near zero percolation potential. The ISC estimates from the *User's Guide for the California Impervious Surface Coefficients,* December 2010 from the Office of Environmental Health Hazard Assessment that best represents the conditions that exist in the Basin was used for estimation of percentage of pervious land surface in this study.

There are 14 ISC values assigned to different land use types in the *User's Guide for the California Impervious Surface Coefficients* report. The 14 values were evaluated and assigned to the four general land use categories of this study based on values that were most suitable to each category. The ISC values were converted to a pervious factor used to represent the perviousness of a surface. This was calculated by subtracting the ISC value from 1. The pervious factor was used in conjunction with soil parameters to calculate the percolation factor. Both the ISC and pervious factor values are provided in Table 11.

Table 11: Land Use Impervious Surface Coefficient and Pervious Factors

Land Use Type	ISC	Pervious Factor
Agriculture	0.04	0.96
Commercial	0.70	0.30
Residential	0.55	0.45
Vacant	0.02	0.98

3.7.2 *Soil Drainage*

Soil types in the Basin were used as an additional factor in establishing a percolation rate and estimating the percentage of applied water that returns to the soil layer. The soil types were based on the Natural Resources Conservation Service (NRCS) dataset. This dataset was the only complete source of soils data within the Basin study area. Each hydrologic soil group (HSG) had an associated drainage factor characterizing the percolation potential. The drainage factor was used in combination with the land use pervious factor to create a percolation factor which controls the amount of applied water available for deep percolation.

Using the HSG categories, an initial numeric factor was assigned to each soil group within the range of initial factors established for the soils drainage classification. Throughout calibration, these values were modified within a reasonable range to improve model calibration. Soil properties are highly variable, even within the soil group classification. As a result, a HSG factor was specified for each GMZ. Two additional subregions in Cactus Valley and Moreno Valley were defined to properly simulate soil properties in those areas. Table 12 presents the drainage factors associated with the HSGs by GMZ or subregion.

Table 12: Initial HSG Drainage Factors

GMZ	HSG			
	A	B	C	D
Initial Drainage Factors				
Basinwide	0.40	0.30	0.20	0.10
Calibrated Drainage Factors				
Perris North	0.30	0.14	0.07	0.005
Moreno Valley	0.30	0.12	0.03	0.005
Perris South	0.30	0.15	0.07	0.005
Menifee	0.30	0.17	0.10	0.005
Lower Pressure	0.30	0.15	0.07	0.005
Lakeview	0.30	0.15	0.07	0.005
Hemet North	0.30	0.17	0.10	0.005
Hemet South	0.30	0.23	0.12	0.10
Cactus Valley	0.30	0.12	0.03	0.005
Upper Pressure	0.30	0.17	0.10	0.005
Canyon	0.25	0.13	0.10	0.005

3.7.3 *Percolation Factor*

The percolation factor represents the percent of applied water or precipitation available to percolate into the groundwater basin. This is the relative amount of water recharged into the Basin. The factor was generated based on land use pervious factor and soil drainage factor as presented in the following equation.

$$Percolation\ Factor = Land\ Use\ Pervious\ Factor * Soil\ Drainage\ Factor$$

The percolation factor changed over time as it was a function of the land use pervious factor, which varied over time with changes in land use. The percolation factor was adjusted based on the simulation results during model calibration by altering the soil drainage factor. The final percolation maps as applied to the model grid for 1999, 2003, and 2010 are presented in Figure 60 through Figure 62.

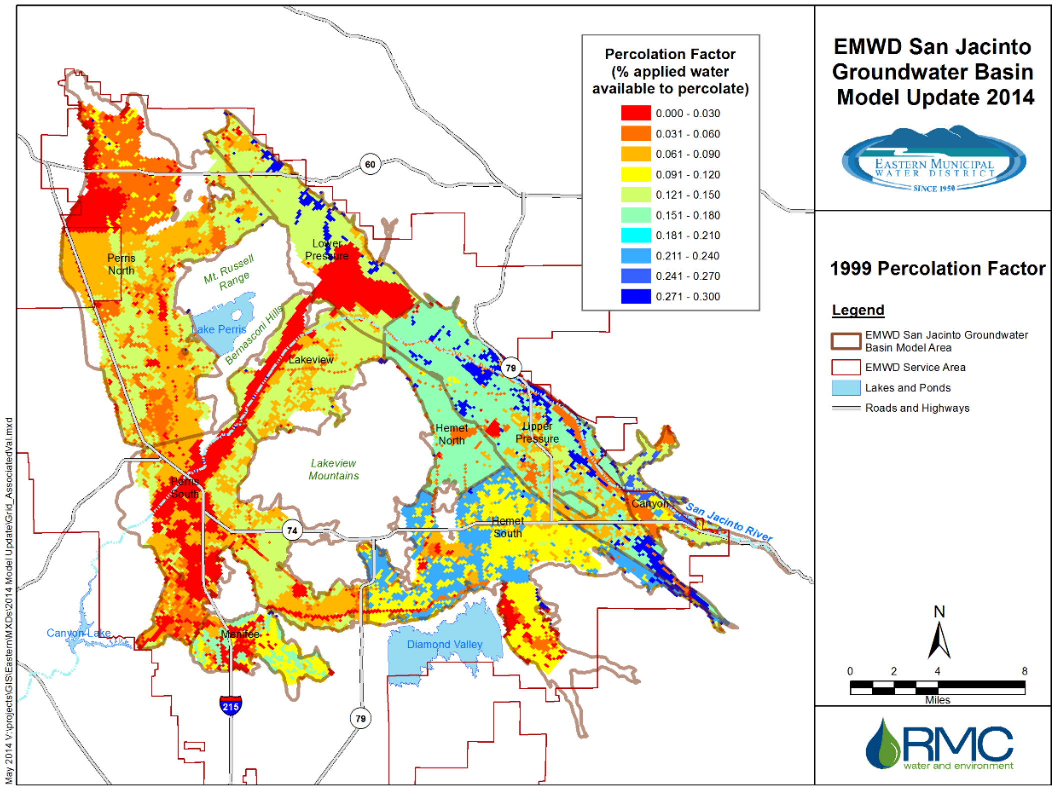


Figure 60: 1999 Percolation Factor

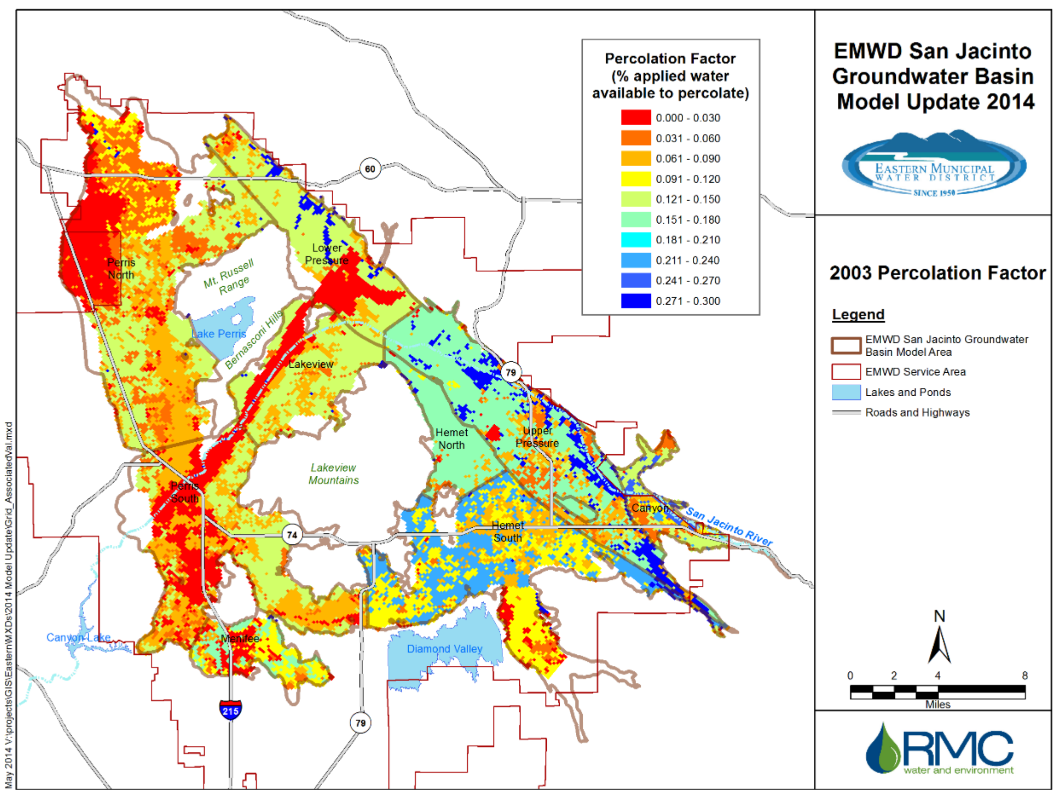


Figure 61: 2003 Percolation Factor

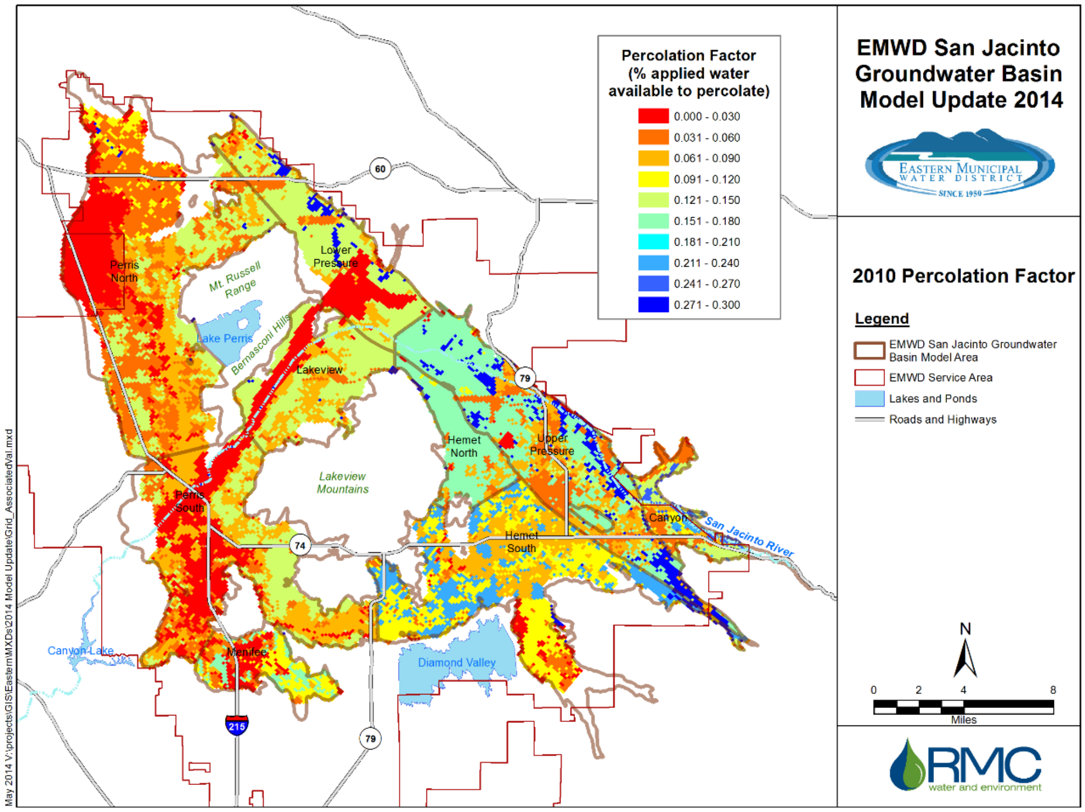


Figure 62: 2010 Percolation Factor

3.7.4 *Geographic Information System (GIS) Processing*

Applied water components in the EMWD database were specified as a collection of several polygons with specified water deliveries to the polygon. For import into the SJFM-2014, these polygons needed to be associated with the model grid cells. The applied water polygons were overlaid with the grid and, by utilizing the intersect function within GIS, smaller polygons were created that contain all the needed data. The resultant polygons are as small as the smallest intersection of the overlain and subsequently computed areas. This process was performed for each applied water component.

Since there were several polygons within each applied water coverage, there were instances where grid cells contained information from multiple polygons that intersected the specific cell. For recharge calculations, only one polygon could be associated per grid cell. In such cases, the polygon that had the maximum amount of area that fell within the cell boundaries was assigned to that cell. In the example presented in Figure 63, both Polygon A and Polygon B intersect a similar model cell. After comparing the calculated areas of Polygon A and Polygon B, Polygon A has the larger area and is assigned to the cell. The comparison of maximum area and cell grid assignment was performed in Microsoft Excel.

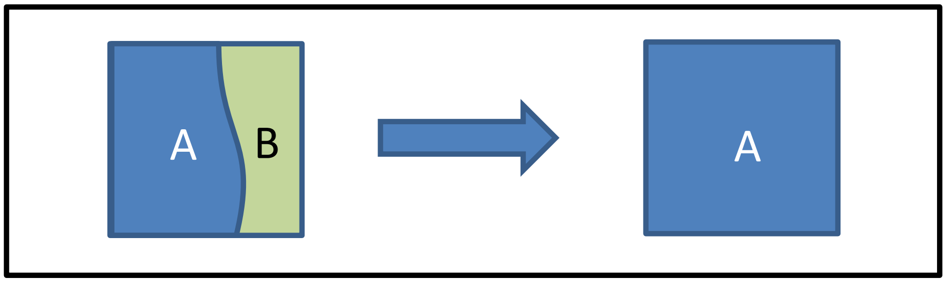


Figure 63: Example of Maximum Area Polygon Grid Assignment at One Model Cell

3.7.5 *Recharge Preprocessor*

To avoid overloading GMS with the large quantity of recharge data, recharge from applied water components and recharge/reclaimed ponds were built outside of the model using a Recharge Preprocessor.

For each active model cell, the Recharge Preprocessor calculated recharge from applied water sources by applying the corresponding percolation factor to each applied water component at that cell. Each active cell was assigned a recharge value by summing the respective recharge quantities based on the applied water or recharge/reclaimed pond associated with the cell. Since the applied water sources covered a widespread area, it was assumed that the water was applied uniformly over each area associated with the source. Due to the transient applied water datasets, a transient MODFLOW recharge file (RCH) was produced by the Recharge Preprocessor. This RCH file was then used in the model runs.

3.8 Point Recharge

The Basin received recharge flows from point sources such as recharge ponds and incidental recharge from reclaimed water facilities. The recharge preprocessor added the recharge quantities at these locations (see Section 2.4) to the RCH file at the corresponding model cells.

The Soboba Pit was modeled differently than the other point recharge sources since the recharge quantities were dependent on flows from the San Jacinto River. The Soboba Pit was modeled using a combination of streambed hydraulic conductivity (K_b) in the San Jacinto River and as a component of applied water recharge through recharge pond input data. The recharge pond input data for Soboba Pit was calculated by removing Bautista Creek flows from San Jacinto River flows in Upper Pressure, without having the Soboba Pit recharge simulated in the SJFM-2014. Since it was expected that Upper Pressure received flow from the San Jacinto River during high flow events, any flows from low flow years were expected to be recharged at Soboba Pit, not including flows from Baustista Creek. Known wet years with high flows were 1993, 1995, 1998 and 2005.

3.9 River Recharge

Streamflows in the model were defined based on parameters of the Streamflow Routing (SFR) package of MODFLOW. These parameters include:

- Streambed hydraulic conductivity (K_b)
- Thickness of streambed material
- Channel cross-section/width