ELLISON SCHNEIDER HARRIS DONLAN

**Robert E. Donlan**
red@eslawfirm.com

May 10, 2022

Clerk of the Board
Santa Clara Valley Water District-HQ
5700 Almaden Expressway
San Jose, CA 95118
Email: clerkoftheboard@valleywater.org

**Re: Claim Against the Santa Clara Valley Water District by Stanford University Regarding Fiscal Year 2021-2022 Groundwater Charges**

Dear Clerk:

On behalf of Stanford University we hereby submit the enclosed Government Claims Act ("Act") claim ("Claim") challenging groundwater charges improperly imposed by Santa Clara Valley Water District ("SCVWD") for fiscal year ("FY") 2021-2022.

Stanford has been engaged in discussions with SCVWD for many years in an effort to resolve disputes regarding SCVWD's groundwater charges. During this time, Stanford continued to pay SCVWD's groundwater charges under protest. As part of those discussions, Stanford has provided technical information demonstrating that Stanford does not benefit from SCVWD's activities for which the groundwater charge is imposed, and that Stanford's recharge activities pursuant to its surface water rights in the Stanford/Palo Alto area are responsible for stable and healthy groundwater conditions in the North County. Despite this information, SCVWD has continued to include the Stanford area in groundwater benefit zone W-2. SCVWD amended groundwater benefit zone W-2 in 2020, again finding that "all well users [including Stanford] in proposed modified Zone W-2 are benefiting in a reasonably similar way from Valley Water activities." Stanford disputes this finding as lacking factual and technical basis and legal justification. In an effort to resolve its dispute with SCVWD, Stanford submitted a proposal to SCVWD that would benefit both parties and the Santa Clara Subbasin. The parties entered into a tolling agreement to provide time to work towards a potential resolution. However, the tolling agreement did not preclude SCVWD from adopting and imposing additional groundwater charges or preclude Stanford from submitting a Claim challenging additional charges. Accordingly, Stanford now submits the enclosed Claim challenging the groundwater charges SCVWD adopted and imposed for FY 2021-2022.

Notwithstanding the submission of this Claim for groundwater charges imposed for FY 2021-2022, Stanford remains committed to working with SCVWD toward an amicable resolution of these issues.

Thank you for your attention to this matter.

Respectfully,

Robert E. Donlan

Encl.
Cc: Tom Zigterman, Stanford University
Jean McCown, Stanford University
Lincoln Bleveans, Stanford University
Eric Wright, Stanford University

# CLAIM AGAINST THE SANTA CLARA VALLEY WATER DISTRICT
## California Government Code Sections 900 and following



| | |
|---|---|
| **The completed form can be mailed, sent electronically or hand delivered. Mail or deliver to:**<br>Clerk of the Board<br>Santa Clara Valley Water District-HQ<br>5700 Almaden Expressway<br>San Jose, CA 95118<br><br>Or submit the completed form electronically to:<br>**clerkoftheboard@valleywater.org** | Clerk of the Board's Date Stamp<br>**For SCVWD Use Only**<br>Date Received:<br>☐ Via U.S. Mail:<br>☐ Hand Delivered:<br>☐ E-mail:<br>☐ Other: _____<br>**ROUTING**<br>☐ CEO:<br>☐ District Counsel<br>☐ Risk Management<br>☐ COB<br>☐ BOD (District #): _____ |

***With certain exceptions, claims for personal injury or property damage MUST be filed within six months of the incident giving rise to the claim****. Claimant must complete each section. If information is unknown, write "unknown" in the appropriate box. Please use additional pages if necessary. Please attach itemized receipts, witness statements, photos and all other documentation that you believe will be helpful to process your claim. Claimant MUST sign and date the form; see last page.*

| | | | |
|---|---|---|---|
| Name of Claimant: Tom Zigterman on behalf of The Leland Stanford Junior University | | | |
| Address of Claimant:<br>315 Bonair Siding | City:<br>Stanford | State:<br>CA | Zip:<br>94305 |
| Mailing Address to Which Notices Should be Sent if Different From Above: | City: | State: | Zip: |
| Home Phone Number: | Cell Phone Number: | Work Phone Number:<br>650-725-3400 | |
| Is this claim being filed on behalf of a minor?<br>☐ Yes ☒ No | If so, please indicate minor's date of birth: _____<br>Relationship to the minor: _____ | | |
| Date and time of incident or loss:<br>Please see Attachment 1. | Location of incident or loss (address):<br>Santa Clara Valley Water District | Is there a police report?<br>☐ Yes If Yes, Police Report #:<br>☒ No | |

Describe how the incident or loss happened, and the reason you believe the Santa Clara Valley Water District is responsible for your damages (*Please attach additional sheets if necessary*):

Please see Attachment 1.

Santa Clara Valley Water District

# CLAIM AGAINST THE SANTA CLARA VALLEY WATER DISTRICT
## California Government Code Sections 900 and following



In detail, describe the damage or injury *(Please attach additional sheets if necessary)*: Please see Attachment 1.

List Name(s) and contact information of any witness(es) or District employee involved (if any):

DAMAGES CLAIMED: Basis for computation of amounts claimed (include copies of bills, invoices, estimates, receipts, photos, police case # or other documentation.) Note: If your claim is more than $10,000, you need not fill in an amount, but must state whether jurisdiction for the claim would be in the Limited Jurisdiction (up to $25,000) or Unlimited jurisdiction of the Superior Court.

Is the amount of the claim under $10,000? ☐ Yes ☒ No

Court Jurisdiction: (Check One) ☐ Limited Civil ☒ Unlimited Civil

| ITEMS | CLAIM AMOUNT |
|---|---|
| 1. Please see Attachment 1. | $ |
| 2. Please see Attachment 1. | $ |
| 3. Please see Attachment 1. | $ |
| 4. Please see Attachment 1. | $ |
| **TOTAL AMOUNT** | $ |

**WARNING: IT IS A CRIMINAL OFFENSE TO FILE A FALSE OR FRAUDULENT CLAIM (Penal Code Section 72 and 550)**

I have read the matters and statements made in the above claim and I know the same to be true of my own knowledge, except to those matters stated upon information and belief and as to such matters I believe the same to be true. I certify under penalty of perjury that the foregoing is TRUE and CORRECT.

Signed this 10th day of May, 20 22

Claimant's signature

Government Code Section 945.6 provides that, with limited exceptions, any suit brought against a public entity must be commenced:

(1) If written notice is given of a denial of claim in accordance with **Section 913**, not later than six months after the date such notice is personally delivered or deposited in the mail.
(2) If written notice is not given of a denial of claim in accordance with **Section 913**, within two years from the accrual of the cause of action.

# ATTACHMENT 1

**Date and time of incident or loss:**

On May 11, 2021, SCVWD adopted Resolution No. 21-22, which determined groundwater production charges ("Groundwater Charges") for Fiscal Year 2021-2022. In accordance with the boundaries Zone W-2 set forth in Resolution No. 20-12 adopted on April 28, 2020[1], the Groundwater Charges for Fiscal Year 2021-2022 apply to Zone W-2 and Stanford.

Pursuant to Resolution Nos. 20-12 and 21-22, SCVWD improperly imposed Groundwater Charges on Stanford in the amounts set forth below. Stanford timely paid (or is in the process of paying) the Groundwater Charges in full under protest and now seeks reimbursement.

| Fiscal Year | Groundwater Charges |
|---|---|
| July 2021 | $ 148,125.83 |
| August 2021 | $ 119,052.60 |
| September 2021 | $ 141,156.15 |
| October 2021 | $ 48,206.23 |
| November 2021 | $ 290.96 |
| December 2021 | $ 8,134.20 |
| January 2022 | $ 336.95 |
| February 2022 | $ 34,327.85 |
| March 2022 | $ TBD[2] |
| April 2022 | $ TBD |
| May 2022 | $ TBD |
| June 2022 | $TBD |
| **Total** | **$ TBD** |

**Describe how the incident or loss happened, and the reason you believe the Santa Clara Valley Water District is responsible for your damages:**

For the reasons set forth below, Stanford is entitled to a full refund for the Groundwater Charges because SCVWD's imposition of the Groundwater Charges on Stanford: (1) violates the District Act; (2) violates Proposition 218 (i.e., Article XIII C of the California Constitution [as amended by Proposition 26] and/or Article XIII D of the California Constitution); (3) unlawfully interferes with Stanford's vested groundwater and surface water rights, including but not limited to the unlawful trespass upon and/or taking of those rights; and (4) violates the Sustainable Groundwater Management Act.

For decades, and prior to creation of the SCVWD, Stanford has undertaken water management activities and projects in and around the University and within the Santa Clara Subbasin that have

[1] Stanford is separately challenging the adoption of Resolution No. 20-12 and the Groundwater Charges for Fiscal Year 2020-2021 (adopted pursuant to Resolution No. 20-31).

[2] Stanford will provide the "TBD" amounts once known, and such amounts shall be deemed included within this Claim.

stabilized local groundwater levels and augmented the groundwater supplies in the subbasin. Starting in the early 1960s, Stanford (along with others in the Stanford/Palo Alto area) began using surface water supplied by the San Francisco Public Utilities Commission, which dramatically reduced groundwater demands in the North County area of the subbasin and resulted in the immediate and significant recovery of groundwater levels in the Stanford/Palo Alto area.

Stanford also diverts surface water from creeks in the San Francisquito Creek watershed pursuant to its very senior appropriative water rights, and uses this surface water in lieu of groundwater underlying University lands. Some of this surface water, such as that diverted to an impoundment known as Lagunita, percolates through the porous soil beneath the reservoir and directly recharges and augments the subbasin in the North County area. Stanford also captures stormwater before that water reaches the area's natural channels and creeks, and Stanford causes that stormwater to collect in Lagunita where it also percolates into the ground and recharges the subbasin. These activities by Stanford provide direct benefits to the subbasin in the Stanford/Palo Alto area. Stanford has demonstrated to SCVWD that it is Stanford's and the City of Palo Alto's groundwater recharge activities in the Stanford/Palo Alto area that are responsible for stable and healthy groundwater conditions in the North County area, not SCVWD's activities in the San Jose area.[3]

Substantial evidence provided to SCVWD demonstrates that the area of the subbasin surrounding Stanford does not benefit from SCVWD's groundwater management activities, including groundwater recharge and distribution of imported water in the southern portion of the subbasin.[4] Stanford is located in a distinct hydrologic area of the basin, and there is no SCVWD water supply infrastructure in the area surrounding Stanford (i.e., the nearest SCVWD recharge facilities are located approximately 10 miles south of Stanford). Stanford does not receive any water deliveries from SCVWD. A technical review of groundwater level fluctuations for wells in the Stanford/Palo Alto area and wells located south of that area in relation to the three major imported water projects[5] for the region substantiates that: (1) SCVWD's activities in the southern portion of the subbasin do not affect or benefit groundwater levels and conditions in the Stanford/Palo Alto area of the subbasin; and (2) the activities of Stanford and Palo Alto in the North County portion of the subbasin are responsible for sustainable and healthy groundwater levels in the Stanford/Palo Alto area.

SCVWD has improperly imposed the Groundwater Charges: (1) on an area of the subbasin that does not benefit from SCVWD's activities; (2) in a manner that, among other things, does not bear a fair or reasonable relationship to Stanford's burdens on the subbasin or the benefits received by Stanford from SCVWD's activities therein, or to the proportional cost of undertaking the activity as it relates to Stanford's burdens on the subbasin or benefits received by Stanford; (3) in a manner

[3] Over many years, Stanford has provided evidence supporting its positions as part of the administrative processes related to SCVWD's groundwater benefit zones and groundwater charges. Stanford's prior claim challenging the adoption of Resolution No. 20-12, which amended groundwater benefit zone W-2, and the Groundwater Charges for Fiscal Year 2020-2021 ("2020-2021 Claim") included comments and evidence that Stanford provided to SCVWD. The 2020-2021 Claim is attached hereto and incorporated herein by this reference.

[4] See Footnote 3.

[5] The imported water projects include: (1) SFPUC surface water imported into the northern portion of the subbasin in 1962; (2) State Water Project surface water imported (by SCVWD) in the southern portion of the subbasin in 1965; and (3) Central Valley Project water imported (by SCVWD) in the southern portion of the subbasin in 1987.

that interferes with and unlawfully regulates Stanford's exercise of its overlying groundwater rights; and (4) in a manner that interferes with and unlawfully regulates Stanford's stormwater recovery activities and surface water rights, including Stanford's right to recapture surface water that Stanford has recharged and stored in the subbasin under senior appropriative surface water rights.

Therefore, Stanford seeks a refund of the Groundwater Charges and demands that SCVWD cease the improper imposition of Groundwater Charges on Stanford.

**In detail, describe the damage or injury:**

See information above.

ELLISON SCHNEIDER HARRIS DONLAN

**Robert E. Donlan**
red@eslawfirm.com

April 23, 2021

Clerk of the Board
Santa Clara Valley Water District-HQ
5700 Almaden Expressway
San Jose, CA 95118
Email: clerkoftheboard@valleywater.org

**Re: Claim Against the Santa Clara Valley Water District by Stanford University Regarding 2020-2021 Groundwater Charges**

Dear Clerk:

On behalf of Stanford University we hereby submit the attached Government Claims Act ("Act") claim ("Claim") against the Santa Clara Valley Water District ("SCVWD") regarding groundwater charges imposed by SCVWD for fiscal year (FY) 2020-2021. (**See, Attachment A**). Stanford submits the Claim in compliance with the Act to preserve Stanford's legal rights and to seek reimbursement of the amounts specified. (**See, Attachment A**).

Stanford has been engaged in discussions with SCVWD for many years in an effort to resolve a disagreement regarding SCVWD's groundwater charges. During this time Stanford paid SCVWD's groundwater charges under protest. As part of those discussions, Stanford has provided technical information demonstrating that Stanford does not benefit from SCVWD's activities for which the groundwater charge is imposed. Despite this information, SCVWD has continued to include the Stanford area in groundwater benefit zone W-2. SCVWD amended groundwater benefit zone W-2 in 2020, again finding that "all well users [i.e., including Stanford] in proposed modified Zone W-2 are benefiting in a reasonably similar way from Valley Water activities." Stanford disputes this finding as lacking factual and technical basis and legal justification. Further, SCVWD determined groundwater charges for FY 2020-2021 and began unlawfully imposing those charges on Stanford.

Notwithstanding submission of the Claim and Stanford's protest to SCVWD's groundwater benefit zone action, Stanford remains committed to working with SCVWD to resolve this dispute.

Tom Zigterman will be contacting SCVWD soon to set up another meeting to discuss resolving this matter, and I will follow up with your counsel as well.

Respectfully,

Robert E. Donlan

Encl.
Cc: Tom Zigterman, Stanford University
Jean McCown, Stanford University
Joseph Stagner, Stanford University
Eric Wright, Stanford University

# CLAIM AGAINST THE SANTA CLARA VALLEY WATER DISTRICT
## California Government Code Sections 900 and following



| | |
|---|---|
| | Clerk of the Board's Date Stamp |
| **The completed form can be mailed, sent electronically or hand delivered. Mail or deliver to:**<br>Clerk of the Board<br>Santa Clara Valley Water District-HQ<br>5700 Almaden Expressway<br>San Jose, CA 95118<br><br>Or submit the completed form electronically to:<br>**clerkoftheboard@valleywater.org** | **For SCVWD Use Only**<br>Date Received:<br>☐ Via U.S. Mail:<br>☐ Hand Delivered:<br>☐ E-mail:<br>☐ Other: _____<br><br>**ROUTING**<br>☐ CEO:<br>☐ District Counsel<br>☐ Risk Management<br>☐ COB<br>☐ BOD (District #): _____ |

***With certain exceptions, claims for personal injury or property damage MUST be filed within six months of the incident giving rise to the claim****. Claimant must complete each section. If information is unknown, write "unknown" in the appropriate box. Please use additional pages if necessary. Please attach itemized receipts, witness statements, photos and all other documentation that you believe will be helpful to process your claim. Claimant MUST sign and date the form; see last page.*

| | | | |
|---|---|---|---|
| Name of Claimant: Tom Zigterman on behalf of Stanford University | | | |
| Address of Claimant:<br>315 Bonair Siding | City:<br>Stanford | State:<br>CA | Zip:<br>94305 |
| Mailing Address to Which Notices Should be Sent if Different From Above: | City: | State: | Zip: |

| | | |
|---|---|---|
| Home Phone Number: | Cell Phone Number: | Work Phone Number:<br>650-725-3400 |
| Is this claim being filed on behalf of a minor?<br>☐ Yes ☒ No | If so, please indicate minor's date of birth: _____<br>Relationship to the minor: _____ | |
| Date and time of incident or loss:<br>Please see attachment. | Location of incident or loss (address):<br>Santa Clara Valley Water District | Is there a police report?<br>☐ Yes If Yes, Police Report #:<br>☒ No |

Describe how the incident or loss happened, and the reason you believe the Santa Clara Valley Water District is responsible for your damages (*Please attach additional sheets if necessary*):

Please see attachment.

Santa Clara Valley Water District

# CLAIM AGAINST THE SANTA CLARA VALLEY WATER DISTRICT
## California Government Code Sections 900 and following



In detail, describe the damage or injury *(Please attach additional sheets if necessary)*:

Please see attachment.

List Name(s) and contact information of any witness(es) or District employee involved (if any):

DAMAGES CLAIMED: Basis for computation of amounts claimed (include copies of bills, invoices, estimates, receipts, photos, police case # or other documentation.) Note: If your claim is more than $10,000, you need not fill in an amount, but must state whether jurisdiction for the claim would be in the Limited Jurisdiction (up to $25,000) or Unlimited jurisdiction of the Superior Court.

Is the amount of the claim under $10,000? ☐ Yes ☒ No

Court Jurisdiction: (Check One) ☐ Limited Civil ☒ Unlimited Civil

| ITEMS | CLAIM AMOUNT |
|---|---|
| 1. Please see attachment. | $ |
| 2. Please see attachment. | $ |
| 3. Please see attachment. | $ |
| 4. Please see attachment. | $ |
| **TOTAL AMOUNT** | $ |

**WARNING: IT IS A CRIMINAL OFFENSE TO FILE A FALSE OR FRAUDULENT CLAIM (Penal Code Section 72 and 550)**

I have read the matters and statements made in the above claim and I know the same to be true of my own knowledge, except to those matters stated upon information and belief and as to such matters I believe the same to be true. I certify under penalty of perjury that the foregoing is TRUE and CORRECT.

Signed this 22 day of April, 20 21

Claimant's signature

Government Code Section 945.6 provides that, with limited exceptions, any suit brought against a public entity must be commenced:

(1) If written notice is given of a denial of claim in accordance with **Section 913**, not later than six months after the date such notice is personally delivered or deposited in the mail.
(2) If written notice is not given of a denial of claim in accordance with **Section 913**, within two years from the accrual of the cause of action.

# ATTACHMENT A

# ATTACHMENT

**Date and time of incident or loss:**

On April 28, 2020, the Santa Clara Valley Water District ("SCVWD") adopted Resolution No. 20-12, which amended SCVWD groundwater benefit zone W-2 ("Zone W-2"). As part of Resolution No. 20-12 and in reliance on SCVWD's Groundwater Benefit Zone Study ("Zone Study"), SCVWD found that "that all well users in proposed modified Zone W-2 are benefiting in a reasonably similar way from Valley Water activities to protect and augment groundwater supplies." SCVWD included Stanford University ("Stanford" or "University") in the boundaries of modified Zone W-2.

On May 26, 2020, SCVWD adopted Resolution No. 20-31, which determined groundwater production charges ("Groundwater Charges") for Fiscal Year 2020-2021. In accordance with the new boundaries of Zone W-2 set forth in Resolution No. 20-12, the Groundwater Charges for Fiscal Year 2020-2021 apply to Zone W-2 and Stanford.

In accordance with Resolution Nos. 20-12 and 20-31, SCVWD has improperly imposed Groundwater Charges on Stanford in the amounts set forth below. Stanford timely paid the Groundwater Charges in full under protest and now seeks reimbursement.

| Fiscal Year | Groundwater Charge |
|---|---|
| July 2020 | $ 147,952.68 |
| August 2020 | $ 132,547.37 |
| September 2020 | $ 96,284.82 |
| October 2020 | $ 55,172.13 |
| November 2020 | $ 74,151.55 |
| December 2020 | $ 68,642.64 |
| January 2021 | $ 20,030.42 |
| February 2021 | $ TBD[1] |
| March 2021 | $ TBD |
| April 2021 | $ TBD |
| May 2021 | $ TBD |
| June 2021 | $TBD |
| **Total** | **$ TBD** |

**Describe how the incident or loss happened, and the reason you believe the Santa Clara Valley Water District is responsible for your damages:**

For the reasons set forth below, Stanford is entitled to a full refund for the Groundwater Charges because SCVWD's imposition of the charges on Stanford: (1) violates the District Act; (2) violates Proposition 218 (i.e., Article XIII C of the California Constitution [as amended by Proposition 26] and/or Article XIII D of the California Constitution); (3) unlawfully interferes with Stanford's

[1] Stanford will provide the "TBD" amounts once known.

vested groundwater and surface water rights, including but not limited to the unlawful trespass upon and/or taking of those rights; and (4) violates the Sustainable Groundwater Management Act.

For decades, and prior to creation of the SCVWD, Stanford has undertaken water management activities and projects in and around the University and within the Santa Clara Subbasin that have stabilized local groundwater levels and augmented the groundwater supplies in the subbasin. Starting in the early 1960's, Stanford (along with others in the Stanford/Palo Alto area) began using surface water supplied by the San Francisco Public Utilities Commission, which dramatically reduced groundwater demands in the North County area of the subbasin and resulted in the immediate and significant recovery of groundwater levels in the Stanford/Palo Alto area.

Additionally, Stanford has diverted surface water from creeks in the San Franciscquito Creek watershed pursuant to its very senior appropriative water rights, and has used this surface water in lieu of groundwater underlying University lands. Some of this surface water, such as that diverted to an impoundment known as Lake Lagunita, is caused to percolate through the porous soil beneath the reservoir and directly recharges and augments the subbasin in the North County area. Stanford also captures stormwater before that water reaches the area's natural channels and creeks, and Stanford causes that stormwater to collect in Lake Lagunita where it percolates into the ground and recharges the subbasin. These activities by Stanford provide direct benefits to the subbasin in the Stanford/Palo Alto area. Stanford has demonstrated to SCVWD that Stanford's and Palo Alto's groundwater recharge activities in the Stanford/Palo Alto area are responsible for stable and healthy groundwater conditions in the North County area, not the SCVWD's activities in the San Jose area.[2]

Substantial evidence provided to SCVWD demonstrates that the area of the subbasin surrounding Stanford does not benefit from SCVWD's groundwater management activities, including groundwater recharge and distribution of imported water in the southern portion of the subbasin.[3] Stanford is located in a distinct hydrologic area of the basin, and there is no SCVWD water supply infrastructure in the area surrounding Stanford (i.e., the nearest SCVWD recharge facilities are located approximately 10 miles south of Stanford). Stanford does not receive any water deliveries from SCVWD. A technical review of groundwater level fluctuations for wells in the Stanford/Palo Alto area and wells located south of that area in relation to the three major imported water projects[4] for the region substantiates that: (1) SCVWD's activities in the southern portion of the subbasin do not affect or benefit groundwater levels and conditions in the Stanford/Palo Alto area of the subbasin; and (2) the activities of Stanford and Palo Alto in the North County portion of the

[2] Stanford has provided evidence supporting its positions as part of the administrative process related to the Zone Study and the adoption of Resolution Nos. 20-12 and 20-31. In addition to meeting with SCVWD to discuss the various issues, Stanford provided SCVWD with comments on the Zone Study, comments on SCVWD's amendment of Zone W-2, comments on the Groundwater Charges in general, and a technical memorandum from Stanford's consultant. These documents are attached hereto and incorporated herein by reference.

[3] See Footnote 2.

[4] The imported water projects include: (1) SFPUC surface water imported into the northern portion of the subbasin in 1962; (2) State Water Project surface water imported (by SCVWD) in the southern portion of the subbasin in 1965; and (3) Central Valley Project water imported (by SCVWD) in the southern portion of the subbasin in 1987.

subbasin are responsible for sustainable and healthy groundwater levels in the Stanford/Palo Alto area.

Based on the above, SCVWD has improperly imposed the Groundwater Charges: (1) on an area of the subbasin that does not benefit from SCVWD's activities; (2) in a manner that, among other things, does not bear a fair or reasonable relationship to Stanford's burdens on the subbasin or the benefits received by Stanford from SCVWD's activities therein, or to the proportional cost of undertaking the activity as it relates to Stanford's burdens on the subbasin or benefits received by Stanford; (3) in a manner that interferes with and unlawfully regulates Stanford's exercise of its overlying groundwater rights; and (4) in a manner that interferes with and unlawfully regulates Stanford's stormwater recovery activities and surface water rights, including Stanford's right to recapture surface water that Stanford has recharged and stored in the subbasin under senior appropriative surface water rights.

Therefore, Stanford seeks a refund of the Groundwater Charges and demands that SCVWD cease the improper imposition of Groundwater Charges on Stanford.

**In detail, describe the damage or injury:**

See information above.

Stanford University

SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E. *via email to vdelapiedra@valleywater.org* March 23, 2018
Unit Manager, Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: Zones of Benefit Study

Dear Ms. De La Piedra:

Thank you for the opportunity to review the subject draft Zones of Benefit Study report. Stanford is reviewing the report, and is intending to prepare comments on it. Given the reliance of the study on a groundwater flow model in finding that benefits of SCVWD activities extend to the northern boundary of the Santa Clara Valley Basin, we would appreciate an opportunity to review additional information on the model used to determine Zones of Benefits, including:

1. Documentation of the original CH2MHill groundwater flow model (1991/2), and modifications thereto that were made in preparing the current findings and report;
2. Groundwater model files, along with descriptions of:
   a. The boundary conditions along San Francisquito Creek (the San Mateo – Santa Clara County line), and;
   b. Aquifer parameters.
3. Baseline and scenario assumptions, such as distinctions in the quantity of natural versus managed recharge in stream channels, that were assumed in deriving scenarios related to benefits; and
4. Thresholds of significance that were used in applying model results to Zones of Benefit findings.

Please let me know how we can receive or access this information, in order to complete our review and comments.

Sincerely,

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Tom Elson, Luhdorff & Scalmanini
Peter Leffler, Luhdorff & Scalmanini

WATER RESOURCES & CIVIL INFRASTRUCTURE GROUP
327 Bonair Siding, Stanford, CA 94305-7272 T 650-725-8081 F 650-723-3191

Stanford University

SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E., Unit Manager *via email to vdelapiedra@valleywater.org* May 11, 2018
George Cook, Specialist *via email to gcook@valleywater.org*
Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: Zones of Benefit Study – Stanford comments

Dear Ms. De La Piedra and Mr. Cook:

Thank you for the opportunity to review the subject draft Zones of Benefit Study report, and for supplying additional information in response to our March 23 letter. We and our consultants, Luhdorff & Scalmanini Consulting Engineers (LSCE), have prepared technical comments on the study – see the accompanying LSCE Technical Memorandum dated May 7, 2018.

This Technical Memorandum enumerates several major concerns about the study's approach to modeling regional groundwater and particularly the study's conclusion that SCVWD groundwater recharge activities (that are several miles away from Stanford and the San Francisquito Cone) benefit the Stanford area. Stanford has long maintained that no demonstrable benefit from SCVWD groundwater recharge activities exists, and therefore the groundwater pumping fees are unjustified. Notwithstanding the flawed modeling approach, the Zone of Benefit Study fails to substantiate any material benefit from SCVWD's groundwater augmentation and management activities.

We would welcome an opportunity to discuss our comments in more detail with you and your consultant, particularly because several SCVWD groundwater staff are new and were not involved in Stanford's prior discussions with SCVWD on these matters several years ago. In light of the identified flaws with the Study and modeling approach, we urge SCVWD to hold off on finalizing the Study or using the Study to support decisions regarding groundwater management or pumping fees until these significant comments are addressed.

Please let me know some dates and times that we can meet. We look forward to continuing our discussions and reaching appropriate conclusions on this important issue.

Sincerely,

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Tom Elson and Peter Leffler, Luhdorff & Scalmanini Consulting Engineers
Karla Daily, Palo Alto

WATER RESOURCES & CIVIL INFRASTRUCTURE GROUP
327 Bonair Siding, Stanford, CA 94305-7272 T 650-725-8081 F 650-723-3191

# Technical Memorandum

DATE: May 7, 2018 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler and Tom Elson

SUBJECT: **PRELIMINARY REVIEW COMMENTS ON SCVWD ZONE OF BENEFITS STUDY**

Luhdorff & Scalmanini Consulting Engineers (LSCE) was requested by Stanford University to review the Santa Clara Valley Water District (SCVWD) Draft Zone of Benefits (ZOB) study dated October 2017. Our review of the ZOB study included a request of selected supporting documents and model files from SCVWD. The requested model reports were subsequently provided to Stanford University along with a portion of the requested model files. Our review comments provided below relate to the ZOB study, the referenced supporting model documentation, and the subset of model files that were provided in response to Stanford's data request.

1) It is important to note that the Zone of Benefits (ZOB) study provides for inclusion of the Stanford area in the ZOB based primarily on groundwater model simulation results. The groundwater level data analysis method, utilizing data only from a 2011 to 2013 time period, was clearly of insufficient duration to prove a benefit to the Stanford area. Due to lack of evidence from the groundwater level analysis, it is very important to evaluate model characteristics and consider likely accuracy of groundwater model predictions in the Stanford area.

2) Our review of all available groundwater level data for the five Stanford wells (the ZOB study only uses three wells) shows a net stable to decreasing trend in water levels during the one evaluation period (2011-2013) used in the study. This is in contrast to the ZOB study claim of stable groundwater levels in the Stanford area during this time (page 68). Furthermore, there was a decreasing water level trend in the adjacent Palo Alto area (Table 8, page 67 of ZOB study) for the 2011-2013 evaluation period. Stanford and Palo Alto overlie a distinct physiographic area in the Santa Clara Valley known as the San Francisquito Cone. Thus, groundwater level trends in Palo Alto and Stanford should be interpreted together as being representative of the Cone, as such, groundwater level trends indicate a definite lack of benefit from District recharge and management activities.

3) The model uses no-flow boundaries along San Francisquito Creek, which also represents the County line and a jurisdictional boundary between Santa Clara Valley Groundwater Basin and San Mateo Plain Groundwater Basin. The justification provided in the Hydrogeologic Interpretation TM for using a no-flow boundary here is it represents a groundwater divide. However, this is poor justification for use of a no-flow boundary condition at this location because it artificially increases model-predicted changes in groundwater levels in the Stanford area from SCVWD recharge activities to the south. This is because the induced stress cannot be dissipated across the County line as will happen in reality (i.e., some of the change in groundwater levels will occur north of the County line and result in less change in groundwater levels in the Stanford area). In summary, the accuracy of model predictions will tend to be poor along model boundaries (especially along no-flow boundaries) compared to locations in the interior of the model domain and this is especially germane to conclusions of benefits in the Stanford-Palo Alto area.

4) The Model Hydrogeologic Interpretation TM states the groundwater model project area includes the southern half of the San Francisquito Cone/Subarea (pages 4-1 to 4-4), which is an area that includes Stanford University. DWR Bulletin 118 describes the Stanford area as part of the San Francisquito alluvial cone. San Francisquito Creek flows through the middle of the alluvial cone and is underlain by the most permeable sediments in the cone, which suggest this location is a poor choice for a model boundary location for the stated purposes of the ZOB study. Given the distinct hydrogeologic features of the San Francisquito Cone and Subarea, the model domain should have included the full extent of the San Francisquito Cone (extending north to Redwood City) and utilized different boundary conditions, such as general head, along the northern boundary of the model to more accurately represent the Stanford area and provide more accurate and reliable model predictions in this area. The incorporation of only half of San Francisquito Cone in the model domain and installation of a no-flow boundary through the middle of the Cone results in poor model simulation results in the Stanford area for the ZOB study.

5) Review of model files relative to horizontal hydraulic conductivity (K) in the Stanford area indicate values in the range of 5 to 10 feet/day. These K values are relatively low compared to site-specific studies and data evaluated by LSCE. Available data for the main portion of San Francisquito Cone indicate hydraulic conductivity values on the order of 10 to 85 feet/day for sediments in the depth range of 150 to 600 feet below ground surface. Use of lower than actual K values in the model will tend to result in overestimation of changes in groundwater levels in the Stanford area, thus over estimating effects from SCVWD recharge activities to the south.

6) Review of model files relative to specific yield (Sy) and storage coefficient (S) values in the Stanford area indicate a uniform Sy value of 0.07 and a uniform S value of 0.0001. These aquifer storage properties represent relatively low values and will tend to result in overestimation of changes in groundwater levels in the Stanford area, thus over estimating effects from SCVWD recharge activities to the south.

7) Based on review of model documentation reports, it does not appear that the model incorporates any stream percolation from San Francisquito Creek where there is a connection to the unconfined aquifer. Given the permeable nature of surficial sediments along upper reaches of San Francisquito Creek, it is expected that natural stream percolation may be a substantial source of water for the Stanford area. It is also not clear if the model accounted for artificial recharge in Lake Lagunita on the Stanford University Campus and irrigation return flows from application of SFPUC system surface water. The apparent lack of accounting for these sources of

recharge to the Stanford area would tend to result in overprediction of the effects of SCVWD recharge activities to the south. The model files provided to us did not include recharge inputs to the model, so this aspect of the model could not be verified.

8) Based on review of model documentation reports, there were no wells in the Stanford area used in model calibration. In addition, the model calibration period began in 1970, and does not capture the maximum period of basin stress in the early 1960's. Stanford area groundwater levels had already recovered approximately 100 feet due to import of SFPUC system water by Palo Alto and Stanford by the beginning of the model calibration period in 1970. These factors result in greater uncertainty regarding the validity of model predictions in the Stanford area.

9) The nearest SCVWD recharge facility is approximately nine and a half miles south of the Stanford area. There was an inability to fully document benefits to Stanford University from review of groundwater level data in the SCVWD ZOB study, and there were small model-predicted changes in groundwater levels in the Stanford area from District activities. Given the various factors cited above, model-predicted changes in groundwater levels are almost certainly over-estimated and not reliable as a basis for determining whether or not Stanford University is within the Zone of Benefits.

10) Non-facility recharge is not well documented in the model report. It is not clear what assumptions are used in terms of natural streambed percolation recharge that would occur without SCWVD facilities vs. the amounts attributed to being related to SCVWD facilities.

11) The discussion and summary of non-facility recharge (page 4-62 of Hydrogeologic Interpretation TM) are acknowledged as being too low, including an apparent estimate of zero recharge attributed to non-facility streams. This does not even consider how much natural recharge would occur on facility streams in the absence of District facilities (i.e., some stream recharge attributed to SCVWD facilities would likely occur naturally in the absence of SCVWD facilities).

12) Recharge from precipitation is quite low (0 – 1.5 inches) relative to total precipitation (14 to 37 inches) throughout the model domain and amounts to only about five percent of total precipitation. As with the apparent underestimation of natural stream recharge cited above in Comments 7, 10, and 11, underestimation of rainfall recharge tends to place greater importance on SCVWD recharge activities (i.e., SCVWD artificial recharge constitutes a greater than actual proportion of the total basin recharge) than likely occurs in reality for the groundwater basin.

13) The model results figures in the ZOB study (e.g., Figures 38 and 39 on pages 78 and 79) do not specify what model layer is being represented by results displayed in the figure. Model results will almost certainly vary by model layer. Appendix H of the ZOB study refers to some additional model files (e.g., GIS shapefiles related to model assumptions, output head files) that may be useful in better understanding these model results; however, these and other important model files were not included in the model files provided to us. The intent of our original model file data request was to obtain all relevant model files; however, we only received a subset of the model files utilized in the ZOB study.

14) The ZOB study did not establish a threshold of significance for a District benefit to a given area. While the minimum model-determined benefit determined in the study was stated to be 3.9 feet (and appears to occur in the Stanford area based on Figure 39 of the ZOB study), the actual benefit in the Stanford area is likely much less than 4 feet due to reasons cited above. It is not clear how the Stanford area experiences any significant benefit from groundwater level increases that are likely to be less than two feet from District-related activities.

15) The ZOB study fails to establish a proportionate range of benefits to acknowledge large benefits in some areas versus minimal to negligible benefits in other areas. It is not reasonable for pumping tax fees to be similar for areas experiencing more than 100 feet of groundwater level increase benefits versus areas experiencing less than 2 to 4 feet of groundwater level increase from District activities.

16) Inasmuch as the model appears to simulate minor benefits that are arguably unrealistic, it should be noted that the siting and construction of SCVWD facilities was based on historic cost benefit analyses in which no benefit (such as up to 4 feet of water level increase as in the model result) was allocated or even described as a project objective for northern areas including the Stanford campus. In fact, records indicate that chronic water level declines due to over pumping in the northern areas were addressed by importing water from the San Francisco regional supply system. This measure was a solution distinct from the recharge facilities now evaluated in the ZOB study.

Overall, there are four major points to summarize from our review of the ZOB study. First, the groundwater level data analysis performed for the Stanford area utilized only one short evaluation period from 2011 to 2013, and our review of a more comprehensive data set indicates stable to decreasing water levels in contrast to ZOB study conclusions. Regardless, the Stanford/Palo Alto area is so distant from the nearest SCVWD recharge facility that it would be essentially impossible to distinguish a small SCVWD benefit in local groundwater level data from the likely more prominent effects of local recharge and pumping.

Second, there are several characteristics of the SCVWD groundwater model in the Stanford area that will tend to cause the model to incorrectly predict greater groundwater level changes attributed to District recharge activities than would be expected to occur in reality. Given that the groundwater model is the primary method applied in the SCVWD ZOB study to conclude that Stanford is within the zone of benefits, modifications to the groundwater model are needed to provide valid and more reliable predictions of groundwater level changes in the Stanford area.

Third, there is a need to establish a level of significance (with sufficient justification for the selected threshold) to estimated groundwater level changes in a given area for which a true benefit is derived from District recharge activities.

Fourth, to the extent that some areas may be shown to exceed the threshold of significance for deriving benefits, there needs to be a sliding scale of pumping assessment rates such that areas receiving only minimal benefits (e.g., less than five feet of groundwater level increase) pay lower rates than areas receiving maximum benefits (e.g., over 100 feet of groundwater level increase) from District recharge activities. While this final point is a matter of fair allocation, the District's study does not provide compelling evidence of even a minimal benefit to the Stanford and Palo Alto area.

Stanford University

SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E., Unit Manager *via email to vdelapiedra@valleywater.org* July 16, 2019
George Cook, Specialist *via email to gcook@valleywater.org*
Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: Zones of Benefit Study – Stanford comments on SCVWD's response to previous Stanford comments

Dear Ms. De La Piedra and Mr. Cook:

We have reviewed the responses to our 2018 May comments on the subject report, and our technical consultant, Pete Leffler at Luhdorff & Scalmanini Consulting Engineers, has prepared the accompanying Technical Memorandum with our comments on the responses. We continue to have a much different perspective on the benefits to the far north county area from the District's recharge activities, and still see no evidence of any benefits to this area in the information provided. Moreover, we continue to question whether the Zone of Benefit Study supports the basis for the District's groundwater fee.

We would welcome an opportunity to discuss our comments with you and your consultant, and I will work with George to schedule that meeting. We look forward to continuing our discussions and reaching appropriate conclusions on this important issue.

Sincerely,

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Tom Elson and Peter Leffler, Luhdorff & Scalmanini Consulting Engineers
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Luhdorff & Scalmanini
Consulting Engineers

# Technical Memorandum

DATE: June 28, 2019 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler

SUBJECT: **LSCE RESPONSES TO LETTER FROM SCVWD AND MONTGOMERY & ASSOCIATES, DATED NOVEMBER 20, 2018 (SCVWD) AND OCTOBER 26, 2018 (MONTGOMERY & ASSOCIATES) AND LSCE COMMENTS ON REVISED DRAFT REPORT DATED APRIL 2019**

## INTRODUCTION

Santa Clara Valley Water District (SCVWD) provided a draft report entitled, "Preliminary Zones of Benefit Study, Santa Clara County, California," prepared by HydroMetrics and dated October 2017. Stanford University and Luhdorff & Scalmanini Consulting Engineers (LSCE) reviewed this study and provided comments in a letter dated May 11, 2018 from Stanford University (with attachment from LSCE dated May 7, 2018). SCVWD responded to Stanford/LSCE draft report study comments in a letter dated November 20, 2018 (with Montgomery & Associates (Montgomery) attachment dated October 26, 2018). SCVWD and Montgomery also prepared a revised draft report entitled, "Preliminary Groundwater Benefit Zones Study, Santa Clara County, California," dated April 2019. This Technical Memorandum (TM) provides LSCE responses to the November 20, 2018 letter from SCVWD (which includes the October 26, 2018 letter from Montgomery) and LSCE's comments on the revised draft report dated April 2019.

## LSCE RESPONSES TO SCVWD LETTER DATED NOVEMBER 20, 2018 (WITH ATTACHMENT FROM MONTGOMERY DATED OCTOBER 26, 2018)

1. LSCE's Comment Number 1 stated in part,"…utilizing data only from a 2011 to 2013 time period, was clearly of insufficient duration to prove a benefit to the Stanford area." While not specifically stating it was in response to this comment, SCVWD/Montgomery stated that they are now also using data for the 1978 to 1982 and 1998 to 2004 time periods in their groundwater level data analysis. SCVWD/Montgomery state that Stanford Well 1 data from 1978 to 1982 shows a stable trend, and Stanford Well 1 and Well 2 data from 1998 to 2004 time period shows an increasing trend.

   ***LSCE Response:*** *The water level data from 1978 to 1982 cannot be used in this analysis because the regional trend of increasing groundwater levels from 1963 to 1984 derives from greatly*

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*decreased pumping by Palo Alto/Stanford between 1962 (in excess of 8,000 AFY) and 1974 (less than 1,000 AFY). Thus, the stable to increasing trend from 1978 to 1982 is clearly due to an extended recovery period from reduced local pumping, as is clearly obvious in all Palo Alto and Stanford wells with data from this time period. The Stanford Well 1 water level dataset is missing data from 1997 to 2000, making it essentially impossible to draw conclusions regarding trends from 1998 to 2004. The Stanford Well 2 dataset is similarly compromised by not having data from 1999 to 2001.*

2. LSCE's Comment Number 2 stated in part that there was a net stable to decreasing trend in water levels during the 2011 to 2013 evaluation period, and that this observation/conclusion is in contrast to the ZOB study claim of stable groundwater levels in Stanford wells during this time. The SCVWD/Montgomery response did not address this comment or make any further observations regarding the Stanford groundwater level data trends over the 2011 to 2013 time period.

   ***LSCE Response:*** *SCVWD/Montgomery apparently do not dispute LSCE's observation of the 2011 to 2013 time period being stable to decreasing in water level trends as opposed to their own statements to the contrary in the ZOB study. Instead, the SCVWD/Montgomery Response turns to two other time periods (1978 to 1982 and 1998 to 2004) in an attempt to support their claims regarding use of groundwater level data trends to support inclusion of the Stanford area in the ZOB. Our review of these two new time periods being added to the analysis is included in our response item 1, which indicate these data periods cannot be used in the analysis. Thus, there remains only the potentially valid time period of 2011 to 2013 as stated in the original ZOB study report, and one can only conclude these data do not support inclusion of the Stanford area in the ZOB.*

3. LSCE's review of groundwater level data for three different time periods as summarized above in items 1 and 2 further supports another statement in LSCE's original Comment 1 on the ZOB study, "It is important to note that the Zone of Benefits (ZOB) study provides for inclusion of the Stanford area in the ZOB based primarily on groundwater model simulation results." In contrast, SCVWD/Montgomery Response letter states, "Groundwater model simulation results are not the primary basis for inclusion of the Stanford area in the ZOB. The primary bases for inclusion of the Stanford area in the ZOB are the groundwater level trend evaluation and information about hydrogeologic connections."

   ***LSCE Response****: As stated above, it is clear that the groundwater level trend evaluation does not support inclusion of the Stanford area in the ZOB. Elsewhere in the SCVWD/Montgomery Response they acknowledge that, "…there are limitations in the data from, and modeling of, the Stanford area used in the study." The SCVWD/Montgomery Response makes no attempt to address or rebut the numerous comments made by LSCE regarding the model and its inadequacies to be used in the ZOB study for the Stanford area. Specifically, no responses are provided to LSCE comments 3 through 13 regarding the groundwater model used in the ZOB study.*

4. The SCVWD/Montgomery Response includes a section entitled, "Hydrogeological Connection with District Activities" that is based on their assumption that, "…benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity." Essentially, this assumption states that whether or not an area is 0.1 miles, 1 mile, 10 miles, or 50 miles away from a District activity, it can be claimed to be within the ZOB if there is continuously mapped alluvium within that area.

   ***LSCE Response:*** *The fact that the ZOB study adopted this hydrogeological connection assumption does not make it correct or valid. A hydrogeologic connection as defined by SCVWD/Montgomery does nothing to prove a benefit is derived by a given area from District activities, it merely indicates a benefit is possible. Thus, it is not a valid assumption to state all that is required is a hydrogeologic connection, rather a hydrogeologic connection is one of multiple requirements to demonstrate a benefit from District activities. The other requirements to demonstrate a benefit are discussed above and in LSCE's original comment letter, and these other requirements are not met.*

5. The SCVWD/Montgomery Response includes a section entitled, "Concept of Proportional Benefit" that states it is not possible to developed tiered zones relative to actual benefits derived from District activities.

   ***LSCE Response:*** *Historical data demonstrate that water levels in the Stanford area are closely tied to local groundwater pumping and development of a surface water supply from SFPUC. Any potential benefits from SCVWD activities are essentially irrelevant to local groundwater levels compared to the impacts of local pumping and use of the SFPUC surface water supply. In fact, development and use of the SFPUC surface water supply by Palo Alto and Stanford (and others in the area) has greatly benefited the groundwater basin managed by SCVWD (by effectively eliminating or greatly reducing pumping from many entities) and providing a source of additional groundwater recharge from outside the basin (e.g., excess irrigation recharge). One could reasonably argue that non-SFPUC water users in the groundwater basin receive an equal or greater benefit from SFPUC water users (including Stanford and Palo Alto) compared any potential benefits received by Palo Alto/Stanford from SCVWD activities. SCVWD would have to expend considerably more money and develop new facilities closer to the Palo Alto/Stanford area were it not for development and use of SFPUC surface water by these North County entities.*

## LSCE COMMENTS ON REVISED DRAFT PRELIMINARY GROUNDWATER BENEFIT ZONES STUDY, MONTGOMERY & ASSOCIATES, DATED APRIL 2019

1. Executive Summary, page 15: The revised report text refers to evaluation of water budgets for the subbasin showing the benefits of District groundwater replenishment activities, including managed recharge and in-lieu recharge, and that without these activities pumping would exceed recharge. Thus, the report claims that District activities improve groundwater levels, thereby providing benefits related to groundwater supply reliability and avoidance of land subsidence and seawater intrusion.

***LSCE Comment:*** *The water balance discussion does not consider the significant benefits of SFPUC surface water, and associated in-lieu and other recharge, to Stanford, Palo Alto, and other North County cities. Also, no details are provided of the various components of natural recharge and District activities to allow for peer review and validation of the summarized water balance in the revised draft report.*

2. Section 2.2, pages 27-28: The revised report text describes the history of SCVWD activities and associated rise/fall of groundwater levels in the basin. This discussion includes a statement that SFPUC water was delivered to north Santa Clara County in the 1950's, but groundwater pumping continued to increase and groundwater levels continued to fall. This discussion implies that delivery of SFPUC water to the Stanford/Palo Alto area did not resolve groundwater level issues in this area.

   ***LSCE Comment:*** *Significant deliveries of SFPUC surface water to the Stanford/Palo Alto area did not start until the early 1960's (approximately 1962). There was an immediate and dramatic response (recovery) in groundwater levels when Stanford/Palo Alto (and others) switched from groundwater pumping to SFPUC surface water supplies in the early 1960's. This recovery lasted at least through the 1980's, clearly correlated to onset of surface water supply use (instead of groundwater pumping) from the SFPUC RWS system. It is clear that the groundwater system budget deficit in the north Santa Clara County area was solved by SFPUC system surface water.*

3. Section 2.3, page 29: The report text states that, "Benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity."

   ***LSCE Comment:*** *This statement/criteria effectively makes all other analyses conducted to show benefits from SCVWD activities for the study unnecessary (e.g., groundwater level evaluation, groundwater modeling). This statement/criteria says that in areas of interconnected alluvium (which could be argued to extend north at least to the northern end of San Mateo Plain west of the Bay and incorporate Niles Cone and possibly East Bay Plain east of the Bay), groundwater pumpers are receiving benefits from District activities that are significant enough to warrant a charge/fee from SCVWD for groundwater pumping. The cut-off of charging for this fee at the San Mateo -Santa Clara County line is a jurisdictional boundary and not a hydrogeologic boundary per this statement. Stanford is located approximately 10 miles north of any SCVWD recharge activity in an area shown to be dramatically influenced by SFPUC surface water use. If not for use of SFPUC surface water in the early 1960's by Stanford, Palo Alto, and others, SCVWD would have had to invest in several additional recharge facilities in this area to provide the recovery in groundwater levels brought about by the SFPUC surface water use in the North County area.*

4. Section 3.2, page 31: The revised report text states, "Natural recharge is insufficient to support groundwater pumping in the subbasin…"; and

Section 3.3, page 32: The revised report text states, "Current groundwater pumping exceeds natural recharge…"

***LSCE Comment**: Natural recharge in the North County area (e.g., San Francisquito Creek, rainfall recharge, bedrock inflow, etc.), Stanford Lake Lagunita recharge, and other sources of recharge are likely more than sufficient to support current/recent groundwater pumping by Stanford and Palo Alto.*

5. Section 4, page 35: The report text provides a high level water budget summary for the year 2013.

   ***LSCE Comment**: 2013 represents the second year of a severe drought and is not representative of average conditions for natural recharge.*

6. Section 4.1, page 35: The report text states, "On average, groundwater accounts for forty percent of the water used in Santa Clara County. Groundwater pumping (approximately 150,000 acre-feet in 2013) far exceeds natural recharge."

   ***LSCE Comment**: These statements do not apply to Stanford (or Palo Alto) and likely others in the North County area.*

7. Section 4.2, page 37: The report text states, "…additional evaluation is required to associate the subsidence benefits to specific sets of District activities and account for other sources of recharge such as rainfall or in-lieu supplies of surface water from San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS)." A similar statement is made with regard to salt water intrusion on page 39 of the revised draft report.

   ***LSCE Comment**: It is not clear where in the revised draft report this additional analysis was conducted, and results provided related to accounting for recharge/in-lieu supplies from SFPUC RWS.*

8. Section 5.1.2, page 45: The revised draft report text states, "Unconsolidated Alluvium is mapped from the northern to the southern boundary of Santa Clara County." Section 5.4 (page 53) of the revised draft report states, "The 2015 USGS report (Wentworth et al., 2015) identifies continuous sedimentary stratigraphy from San Jose to the Palo Alto area." Section 6 (page 59) of the revised draft text states, "Water budgets for potentially hydrogeologically connected areas demonstrate the benefits form the District's groundwater replenishment activities."

   ***LSCE Comment**: Unconsolidated Alluvium essentially extends all around (East Bay north to Richmond, South Bay, West Bay up to at least Foster City) and beneath San Francisco Bay. Thus, the concept of demonstrating that a given area benefits from SCVWD activities as solely demonstrated by hydrogeologic connection of continuous alluvium is effectively meaningless. If this were true, then the Zone of Benefits Study would have only needed to provide a geologic map of alluvium and no other work needs to be done to prove a benefit from SCVWD activities. All the other evaluations and discussions in the report related to groundwater levels and*

*groundwater modeling are unnecessary, because regardless of the outcome of those analyses the report will conclude a benefit exists for all areas within the study area simply because they are underlain by alluvium. In fact, this reasoning/rationale means that benefits from SCVWD activities would extend to a given area no matter how far away it is from SCVWD recharge facilities, including well beyond the boundaries of Santa Clara Valley Water District. While a hydrogeological connection is part of the requirements to prove a benefit from SCVWD activities, other requirements must also be met to prove a benefit.*

9. Section 6.1 page 59: The revised draft report states, "Natural recharge is not sufficient to support groundwater pumping in the subbasin…Groundwater replenishment activities are needed to balance groundwater pumping with total recharge…If groundwater pumping were to exceed recharge, groundwater levels would decline, resulting in…increased risk of land subsidence and saltwater intrusion. The plots show that groundwater replenishment activities are needed in all years."

   ***LSCE Comment**: This water budget analysis completely ignores vast differences in local water budgets compared to the District-wide water budget and ignores the use of SFPUC surface water in the Stanford/Palo Alto and surrounding North County region. Given the minimal groundwater pumping, the water budget in the Stanford/Palo Alto area likely even has recharge in excess on groundwater pumping, thereby providing benefits to the rest of the basin. Groundwater level declines in the Stanford/Palo Alto area are prevented by use of SFPUC surface water in the area. If SFPUC surface water were not used, the SCVWD would have to install very expensive managed recharge facilities in the Stanford/Palo Alto area to prevent groundwater declines and reduce potential for land subsidence and sea water intrusion.*

10. Section 6.3, page 66: The revised draft report text states, "Recycled water deliveries by the Palo Alto…Water Recycling systems supported by the District that reduces groundwater pumping…" and Section 7.3, page 73 states recycled water deliveries, "…are a relatively small part of the overall budget and therefore the effect is not expected to be observed in the groundwater level evaluation."

    ***LSCE Comment**: What groundwater pumping in the Stanford/Palo Alto area is being reduced by this activity, where SFPUC surface water is the primary source of supply? Furthermore, the report essentially says these recycled water deliveries are insignificant and local basin benefits cannot be quantified.*

11. Section 8, page 77: The revised draft report text item 2.b states that the groundwater level evaluation conducted for the report looked at time periods where groundwater levels would be expected to decline without SCVWD activities and, if groundwater levels during these time period were instead stable or increasing, a benefit from SCVWD activities is demonstrated. However, it goes on to say that even if groundwater levels show a declining trend during these selected time periods, it, "…does not indicate lack of benefit from District activities as the District activity may still be benefitting by limiting the decline in groundwater levels." In

addition, under Section 8.1 on page 77, the revised draft report text states, "Decreasing groundwater level trends are likely to be observed in many evaluation periods even with benefits from District activities occurring due to the rainfall and area pumping conditions."

***LSCE Comment**: Effectively, this report text states that no matter whether the trend in groundwater levels in these specially selected time periods is increasing, stable, or decreasing, a benefit from SCVWD activities is demonstrated. Why bother to do this analysis because the report derives the same conclusion (any given area benefits from SCVWD activities) regardless of the outcome of the analysis?*

12. Section 8.1.2.1, page 79: The report text states, "…the Study maps retailer areas receiving water from San Francisco Public Utilities Commission's RWS supplies…" and shows a map of these areas in Figure 26 on page 80.

    ***LSCE Comment**: The map shows a very large area of SFPUC RWS water supplies for the region from Stanford/Palo Alto extending south and east to San Jose Water Company's service area and east to the east bay hills. The report does not address the benefits derived from SFPUC RWS water to the area in its evaluation of groundwater level trends and other analyses.*

13. Section 8.1.3, page 89: The report text states, "The Study does not evaluate managed recharge of imported water separately from managed recharge of local runoff because all managed recharge systems in Santa Clara Subbasin are connected to imported water supplies."

    ***LSCE Comment**: The Study does not quantify (and subtract) the amount of local runoff that would recharge the basin anyway without SCVWD facilities, but rather assumes all that natural recharge from stream infiltration is due to SCVWD facilities.*

14. Section 8.2.4, page 111: The report text describes various time periods for Palo Alto and Stanford where the Study claims groundwater level trends show benefits from SCVWD activities.

    ***LSCE Comment**: The time periods 1975-1982 and 1978-1982 are greatly impacted by the ongoing long-term groundwater level recovery trend from the region converting from primarily groundwater use to SFPUC RWS supply in the 1960's and cannot be used for groundwater level evaluation in the Study. The 1998-2002 time period represents part of a longer-term recovery from increased groundwater pumping during the drought in the late 1980's/early 1990's and cannot be used for groundwater level evaluation in the Study. The 2011-2013 time period actually shows stable to decreasing groundwater level trends and does not support the Study conclusion of demonstrating benefits from SCVWD activities. Overall, none to the selected time periods for the Stanford and Palo Alto groundwater level evaluation support the Study conclusion of demonstrating benefits from SCVWD activities in this North County region.*

## Robert Donlan

**From:** Pete Leffler <pleffler@lsce.com>
**Sent:** Friday, September 13, 2019 2:31 PM
**To:** Vanessa De La Piedra; George Cook; Cameron Tana (ctana@elmontgomery.com); Tom W Zigterman; Julia Nussbaum; Dailey, Karla; Anthony Fulcher; Derrik Williams; Robert Donlan; Tim Guster Great Oaks Water Company; Chanie Abuye; Darin Taylor
**Cc:** Garth Hall
**Subject:** RE: Agenda for Groundwater Benefit Zone Study Mtg 9/16
**Attachments:** TECH MEMO_LSCE Responses to SCVWD_Sept132019_Final.pdf

Hi Vanessa,

Attached is a response TM to help facilitate our technical discussion on Monday for the North County area.

Thanks!

**Peter Leffler**
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**From:** Vanessa De La Piedra <vdelapiedra@valleywater.org>
**Sent:** Thursday, September 12, 2019 5:22 PM
**To:** George Cook <GCook@valleywater.org>; Cameron Tana (ctana@elmontgomery.com) <ctana@elmontgomery.com>; Tom W Zigterman <twz@stanford.edu>; Julia Nussbaum <juliann@stanford.edu>; Dailey, Karla <Karla.Dailey@CityofPaloAlto.org>; Adam W. Hofmann <AHofmann@hansonbridgett.com>; Anthony Fulcher <AFulcher@valleywater.org>; Derrik Williams <dwilliams@elmontgomery.com>; Charles@CatalystGroupCA.com; Pete Leffler <pleffler@lsce.com>; red@eslawfirm.com; jroeder@greatoakswater.com; Tim Guster Great Oaks Water Company <tguster@greatoakswater.com>; Chanie Abuye <CAbuye@valleywater.org>; Darin Taylor <DTaylor@valleywater.org>
**Cc:** Garth Hall <ghall@valleywater.org>
**Subject:** Agenda for Groundwater Benefit Zone Study Mtg 9/16

Hello,

Attached is the proposed agenda for our meeting Monday 9/16 beginning at 1 pm. Please let us know if you have any suggested edits or additions.

Thanks,
Vanessa

**VANESSA DE LA PIEDRA, P.E.**
GROUNDWATER MANAGEMENT UNIT MANAGER
Water Supply Division
Tel. (408) 630-2788

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

-----Original Appointment-----
**From:** George Cook
**Sent:** Tuesday, September 3, 2019 3:11 PM
**To:** George Cook; Vanessa De La Piedra; Cameron Tana (ctana@elmontgomery.com); Tom W Zigterman; Julia Nussbaum; Dailey, Karla; Adam W. Hofmann; Anthony Fulcher; Derrik Williams; Charles@CatalystGroupCA.com; pleffler@lsce.com; red@eslawfirm.com; jroeder@greatoakswater.com; Tim Guster Great Oaks Water Company
**Cc:** Garth Hall
**Subject:** Groundwater Benefit Zone Study
**When:** Monday, September 16, 2019 1:00 PM-5:00 PM (UTC-08:00) Pacific Time (US & Canada).
**Where:** Headquarters Rm A-143

Hi Everyone,

The date has been changed to Monday September 16 as everyone is available that day. Thank you for your patience and quick response.

George

Luhdorff & Scalmanini
Consulting Engineers

# Technical Memorandum

DATE: September 13, 2019 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler

SUBJECT: **PRELIMINARY RESPONSES TO SCVWD LETTER DATED AUGUST 21, 2019 AND MONTGOMERY ASSOCIATES LETTER DATED AUGUST 16, 2019**

## INTRODUCTION

This Technical Memorandum (TM) provides our preliminary responses to letters from the Santa Clara Valley Water District (SCVWD) dated August 21, 2019 and Montgomery Associates (MA) dated August 16, 2019. The SCVWD and MA letters provide responses to a Stanford letter dated July 16, 2019 and Luhdorff & Scalmanini Consulting Engineers (LSCE) TM dated June 28, 2019. LSCE had originally provided comments dated May 7, 2018 on the Draft Zone of Benefits (ZOB) Study for SCVWD (prepared by MA). This response is preliminary and not comprehensive due to limited time available for review and introduction of new modeling results by SCVWD/MA that were not previously referenced or made available for our review. Thus, the comments below attempt to address the primary issues from our initial review and may be supplemented with additional review comments at a later date.

## PRELIMINARY REVIEW COMMENTS

1. The District states that groundwater modeling results are not needed to support District claims; and that groundwater level evaluation and hydrogeologic connection analysis results are sufficient by themselves to support District claims (District Letter, Page 1, 2nd Paragraph).

   ***LSCE Response:***

   a. *Despite the statement above, Montgomery Associates (MA) responses refer to support from groundwater modeling results on numerous occasions; some examples include M&A responses to LSCE comments B-4, B-6, and B-7 (page 8 of M&A letter), M&A response to LSCE comment B-9 (page 9 of M&A letter), M&A response to LSCE comment B-10 (page 11 of M&A letter), and M&A response to LSCE comment B-12 (page 12 of M&A letter).*

   b. *As described elsewhere in this TM, groundwater level evaluation conducted for the Zone of Benefits study does not support District claims with respect to the Stanford/Palo Alto area.*

c. *The District/MA switch from use of the District groundwater model to claims based on a new Todd model for City of Palo Alto Indirect Potable Reuse (IPR) study.*

   1) *MA cite claim of 2,300 acre-feet per year (AFY) of groundwater inflow from the south (Santa Clara Plain) into the model domain from a future baseline (2015-2044) Todd model run (MA Letter, Page 10).*

      a) *The Todd Report review/assessment of historic and current water balances shows no groundwater inflow from the south. This is based in part and confirmed by observed groundwater level data and groundwater elevation contours showing a groundwater flow direction that is parallel to southern model boundary. Thus, the cited future scenario model results do not agree with historic/current observed data.*

      b) *Inflow across the southern model domain of the Todd model is strictly dependent on the specific assumptions made and incorporated in the general head boundary condition at this location. The details of the model baseline run and assumptions are not described in the City of Palo Alto IPR report. LSCE requested to obtain additional details on this topic, including model files, from SCVWD but has not yet been provided this information for review.*

      c) *A local model, such as prepared by Todd for the IPR study, is not an adequate tool/method for evaluating potential benefits from Valley Water activities in the Stanford area. The use of a groundwater model for the Zone of Benefits study should be a regional scale model of the Santa Clara Plain and surrounding areas (e.g., San Mateo Plain) that address previous LSCE comments on the regional-scale model originally cited in the Zone of Benefits study.*

2. District cites text in a Geomatrix (1992) report purported to demonstrate that connection between water levels in the Stanford area and conditions in the larger Santa Clara Subbasin (District Letter, Page 1, 3rd Paragraph).

***LSCE Response:***

a. *The Geomatrix report text cited by the District is very general and non-specific as to location of pumping, and there was no detailed analysis conducted by Geomatrix in support of the cited text.*

b. *The Geomatrix report text also notes in reference to Stanford well water levels that, "The recovery of groundwater levels in both wells appears to have continued into the 1980s."*

c. *One of the Geomatrix report conclusions is, "Groundwater pumping likely will be limited by SCVWD's restrictive fee schedule rather than by hydrogeologic constraints."*

d. *A Geomatrix report conclusion states, "Groundwater levels must be allowed to recover…during the next wet period, so that the groundwater reservoir will be recharged for*

*use during the next dry period." This statement supports LSCE contention that the initial portion of the 1998-2004 evaluation period was influenced by recovery of groundwater levels from pumping by Palo Alto/Stanford (and perhaps others) during the late 1980s/early 1990s drought period.*

3. The District states, "Stanford and others have also questioned the accounting for the benefits of SFPUC. Valley Water acknowledges that SFPUC deliveries benefit the Santa Clara Subbasin by reducing pumping (also called in-lieu recharge). (District Letter, Page 1, 4th Paragraph).

***LSCE Response:***

a. *It is important to note that SFPUC deliveries provide more than just in-lieu recharge. SFPUC deliveries also provide direct recharge to the subbasin from a water source outside the subbasin via recharge of excess irrigation water at residences, parks, and other irrigated lands, and also provide opportunities for use of recycled water derived from SFPUC deliveries within the subbasin.*

4. The District states, "While the study is conservative in accounting for the effects of SFPUC deliveries, it focuses only on the benefits from Valley Water activities…" (District Letter, Page 1, 4th Paragraph).

***LSCE Response:***

a. *It remains unclear how the Zone of Benefits study accounted for effects of SFPUC deliveries in any fashion (much less being "conservative" in this regard), other than by acknowledging that SFPUC deliveries have and do occur (resulting in reduced basin groundwater demand).*

5. The District argues that basinwide water budget components overwhelm SFPUC RWS water budget components, "While the basin benefits from the delivery of SFPUC supplies, the recharge volumes provided by Valley Water managed and in-lieu recharge are far greater." (District Letter, Pages 1 and 2, 4th Paragraph).

***LSCE Response:***

a. *The key issue here is the groundwater basin is very large and it is very important to consider local water budget components that have a much larger and overriding influence on individual well water levels compared to regional water budget components located much further away.*

6. The District states that it is impossible to implement a gradual change in pumping fees based on distance away from District activities and that all users should pay the same amount for the shared resource (District Letter, Page 2, 2nd Paragraph; MA Letter, Pages 5 and 6).

***LSCE Response:***

a. *Given that there is no threshold of significance for "benefits" from District activities, as it stands right now the District is arguing that an area that receives 0.1 foot of water level*

*benefit should pay the same amount as an area that receives 100 feet of water level benefit from District activities.*

b. *One alternative is to establish a reasonable significance threshold for District benefits (e.g., 5 feet), plus discounting of the fee for areas that contribute to the basin water balance by bringing in non-SCVWD surface water sources for in-lieu and direct uses and for other mechanisms of subbasin recharge (e.g., Lake Lagunita).*

7. MA states that the time period from 1975/1978 to 1982 is not part of the extended recovery period as stated by LSCE; therefore, increasing groundwater levels during this time period support District benefit claims (MA Letter, Pages 1 and 2).

***LSCE Response:***

a. *Despite the statement above (and while two Palo Alto wells have one or two data points that might be interpreted to suggest temporary stabilization of water levels between 1970 and 1972), water levels from two other Palo Alto wells plus the overall trend from Stanford wells do not show stabilization of water levels until the early 1980's and later.*

b. *While City of Palo Alto groundwater pumping essentially went to 0 immediately after 1962 (until 1988), Stanford groundwater pumping continued at over 1,000 AFY (to as much as 2,100 AF in 1968) from 1960 to 1973. After 1973, Stanford groundwater pumping was less than 500 AFY except in 1988, 1990, 2001, and 2007-2008. Thus, it is not possible for stabilization in the Stanford/Palo Alto area to have occurred in 1970-72 as suggested by MA, because the Stanford area had to recover from abrupt reductions in local pumping after 1973 along with the continuation of ongoing recovery from reductions in local pumping after 1962.*

c. *Groundwater elevations in Palo Alto Rinconada and Seale wells (the two wells with slight indication of stabilization in 1970-72) were -20 to -40 feet MSL in 1970-72, whereas groundwater elevations ultimately recovered in these wells to +20 to +30 feet MSL by the late 1980's. Again, it is clear these two wells were in recovery during the 1970s and early 1980s during the proposed groundwater level evaluation period.*

8. With regard to the 1978 to 1982 groundwater level evaluation period, MA states, "Annual precipitation increases are another possible explanation for this increase, so this period is not included as an evaluation period for Valley Water benefits." (MA Letter, Page 2).

***LSCE Response:***

a. *We note that MA states here that they disqualified the 1975/78 to 1982 period as a groundwater evaluation period for Valley Water benefits due to increasing precipitation over this period, even though the following sentence incorrectly cites the groundwater level trend from 1975 to 1982 as demonstrating a benefit from Valley Water.*

9. MA states that the 2001 to 2004 period can be used as a groundwater level evaluation period to show District benefits, and show stable/increasing levels at Stanford Wells 1 and 2 (MA Letter,

Pages 2 and 3).

***LSCE Response:***

a. *For the period from 1998 to 2004, Stanford groundwater pumping peaked in 2001 and the minimum occurred in 2003. This pumping pattern would cause stabilization of groundwater levels in the Stanford area over the proposed 2001 to 2004 evaluation period due to changes in local pumping rates alone; thus, this period cannot be used by the District to evaluate benefits.*

10. MA states, "We do not dispute LSCE's observation of the 2011 to 2013 time period being stable to decreasing in water level trends, which is consistent with the evaluation of trends during this time period in the Palo Alto area in the study report." (MA Letter, Page 3).

***LSCE Response:***

a. *We note that MA concurs with LSCE that the 2011 to 2013 evaluation period for groundwater levels, which was the only groundwater level evaluation time period used in the original draft ZOB study, and cannot be used to prove a benefit from SCVWD activities.*

11. Under LSCE Response A-4, LSCE essentially argues that MA needs to provide more evidence of a District benefit to Stanford that just saying there is a hydrogeologic connection. MA's response is that LSCE mischaracterized the ZOB study and cites the following quote from the ZOB report, "If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions are made: Benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity." (MA Letter, Page 4).

***LSCE Response:***

a. *The response by MA confirms LSCE's comment that if a benefit cannot be proved by groundwater level evaluation or modeling, having a hydrogeologic connection is adequate evidence (by itself) to conclude the area receives a District benefit. LSCE has demonstrated through previous and current comments that the groundwater level evaluation and groundwater modeling are not sufficient to prove a benefit to the Stanford (and Palo Alto) area. Thus, the only remaining argument for a benefit is hydrogeologic connection; however, this is not sufficient in and of itself to prove a benefit (but rather is one of multiple requirements to demonstrate a benefit).*

12. MA states that evaluation of benefits from SFPUC RWS water were not included in ZOB study because they are trying to isolate the benefits of District water, and it would be a separate policy discussion to potentially assign credits for basin recharge from other water sources such as SFPUC RWS water (MA Letter, Pages 5 and 8).

***LSCE Response:***

*a. These points should be clarified in the ZOB study report: that the ZOB evaluation does not actually account for SFPUC RWS water other than acknowledging it exists, and that any such claims of credits from SFPUC RWS would have to be considered by the District as a separate policy decision.*

13. MA states, "We added recognition to this discussion of recovery that occurred in the 1960s after SFPUC surface water supplies replaced Stanford/Palo Alto groundwater pumping." (MA Letter, Page 7).

***LSCE Response:***

*a. It is important to note that Stanford pumping was not reduced until after 1973. This should be stated in the ZOB study report, and the ramifications of this fact should be incorporate in the assessment of groundwater level evaluation periods.*

14. In referring to how SFPUC water deliveries were accounted for in the analysis, MA states, "This methodology addresses benefits from in-lieu recharge by SFPUC surface water deliveries to the Stanford/Palo Alto area by limiting evaluation periods to when pumping from the areas are stable or increasing." (MA Letter, Page 9).

***LSCE Response:***

*a. It is not clear how this selection of evaluation periods incorporates or addresses the multiple benefits of SFPUC surface water deliveries.*

*b. LSCE describes elsewhere in this TM that Stanford pumping was decreasing during the 2001 to 2004 evaluation period; thus, this time period is disqualified from use as an evaluation period per the criteria cited by MA above.*

15. MA states, "While there would be natural recharge through streams without Valley Water's managed recharge, it would be far less without our infrastructure, water supplies, and water management." (MA Letter, Page 12).

***LSCE Response:***

*a. The District/MA somewhat acknowledge but make no attempt to quantify how much stream percolation would/did occur naturally independent of District activities. Natural stream recharge should be quantified and included in the basin water balance as non-District water (i.e., included as part of natural basin recharge).*

**Stanford University**
Sustainability and Energy Management
Water Resources & Civil Infrastructure
315 BONAIR SIDING, 2ND FLOOR
STANFORD, CA 94305-7272

Valley Water - Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3686

October 8, 2019

Subject: Zones of Benefit Study – Stanford comments on Valley Water's letter dated September 24, 2019

Dear George:

This letter transmits our responses to your September 24 letter. Hopefully, this technical review information will substantiate our contention that the Study does not demonstrate the benefit of Valley Water's recharge activities to the north county area. We had already agreed that two of the three event periods that were initially used to conclude benefit to the north county are actually inconclusive; and the third period is also inconclusive if you look at pumping and rainfall data, as described in our review comments. Further, the Study did not identify and evaluate other significant factors and activities that affect changes in groundwater levels, such as fluctuations in annual rainfall and impoundment of stormwater runoff and diverted surface water and managed percolation of that water in an unconfined zone. You are therefore left with a Study that does not consider all relevant factors, and is inconclusive at best about benefit in the north county from Valley Water's activities.

As was stated by Valley Water staff at our meeting last month, the Study was structured to look at only Valley Water activities, and to only look at whether there could be any benefit at all from Valley Water's activities; in short, the Study concluded that there is benefit if the area overlies the groundwater basin. Further, no attempt was made to recognize even order-of-magnitude differences in extent of benefit from District activities, which becomes starkly evident as you move into the north county area. Notwithstanding staff's defense of the Study, a gradation of benefits analysis is both feasible and fair, and has been performed by other water districts in California. The Study should be expanded to take into account the relative extent and magnitude of benefits from other factors and activities that account for groundwater recharge and recovery, besides just Valley Water's activities. These factors and activities must be recognized in the mapping of benefit zones. Stanford is willing to work with Valley Water to evaluate the technical information to substantiate and quantify these other factors and activities.

We also encourage staff to recognize the benefits to the groundwater basin that result from recharge activities by others, including Stanford, such as use of imported water and local groundwater recharge and conjunctive use activities, and consider development of a mechanism and policy to account for them in the determination of groundwater pumping charges, possibly as a credit or offset to Valley Water's groundwater fee. For example, Stanford causes groundwater recharge through its investments in infrastructure to capture foothills runoff in Lagunita and to divert surface water and lake water filter backwash water to Lagunita, which percolates directly into the San Francisquito Creek Cone and groundwater basin. The staff report identifies challenges to such a process, but acknowledges that this is a viable concept and requests Board direction. We believe such groundwater recharge activities should be encouraged and recognized through a mechanism of analysis and quantification and offsets to groundwater pumping charges.

We hope that the Board will provide direction to staff to work further with stakeholders on:

1. A comprehensive determination of benefit considering all factors and others' activities;
2. Recognizing and developing a gradation of benefits approach;
3. Developing a methodology for offsets or credits to recognize local investment in groundwater recharge activities which, incidentally, is precisely what Valley Water funds through its groundwater fee.

We look forward to continuing to work with you on these important issues.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman
Director – Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Pete Leffler, LSCE

Luhdorff & Scalmanini
Consulting Engineers

# Technical Memorandum

DATE: October 7, 2019 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler

SUBJECT: **PRELIMINARY RESPONSES TO VALLEY WATER LETTER DATED SEPTEMBER 24, 2019**

## INTRODUCTION

This Technical Memorandum (TM) provides our preliminary responses to a letter from Valley Water dated September 24, 2019, which is responding to a LSCE TM dated September 13, 2019. The comments below are not comprehensive and only attempt to address the primary issues raised in the Valley Water letter.

## SUMMARY

The Zone of Benefits study purports to rely on three lines of evidence to demonstrate a benefit in the Stanford/Palo Alto area from Valley Water activities: 1) groundwater modeling: 2) groundwater level evaluation: and 3) hydrogeologic connection. Stanford/LSCE provided several comments on the groundwater modeling conducted for the draft ZOB study in our May 2018 letter/TM, which have not been responded to by Valley Water (because the model is not relied upon to demonstrate a benefit). Thus, the groundwater model used in the ZOB study is inadequate for demonstrating benefits. The draft ZOB study started out with one groundwater level evaluation time period to demonstrate benefits (2011-2013) in the Stanford area, but then a subsequent draft added two additional groundwater level evaluation periods (1978-1982 and 2001-2004) after Stanford/LSCE demonstrated that 2011-2013 was not a valid evaluation period. It has subsequently been demonstrated in Stanford/LSCE letters/TMs (including this one) that neither the 1978-1982 nor the 2001-2004 time periods are valid for groundwater level evaluation, which is likely why these two time periods were not selected in the original draft report. Valley Water subsequently agreed 2001-2004 is not a valid evaluation period, and this TM further demonstrates that 1978-1982 is not a valid period. Thus, the groundwater level evaluation analysis for the Stanford/Palo Alto is inconclusive at best and clearly is insufficient to demonstrate benefits. Hydrogeologic connection, which should be considered a requirement along with an additional line of evidence to demonstrate a benefit, was not fully evaluated for the Stanford/Palo Alto area. If hydrogeologic connection alone were sufficient, the ZOB study served no purpose.

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## PRELIMINARY REVIEW COMMENTS

1. In response to LSCE Comment 1, Valley Water states that groundwater modeling provides additional support for the benefits demonstrated by the groundwater level evaluation. Valley Water also cites acknowledgement by LSCE at our September 16, 2019 meeting that, "…if Valley Water activities ceased to occur, groundwater levels in the Stanford area would be lower."

   ***LSCE Response:***
   *The current letter from Valley Water is in conflict with the previous letter from Valley Water (August 16, 2019), which states groundwater model results are not being relied upon to demonstrate a benefit in the Stanford area. Regardless, Valley Water has not responded to numerous comments and concerns expressed by Stanford/LSCE in our previous review comments (May 2018) regarding the groundwater modeling tool described in the ZOB study. With regard to the note about water levels being lower in the Stanford area without Valley Water activities, Stanford/LSCE recall this conversation somewhat differently. Stanford stated that ceasing Valley Water recharge activities would have no detrimental effect on the Stanford area. LSCE commented that ceasing Valley Water recharge activities may result in a groundwater flow direction towards the south assuming groundwater pumping in the middle to southern portion of the county was at pre-1970 levels and Stanford/Palo Alto had essentially no pumping in the north county area (this statement also assumes hydrogeologic connection exists, which is not fully evaluated in the ZOB study). Regardless, this Valley Water comment is taken out of context of the primary themes of our discussions at the meeting. The context of the discussion was really about why Stanford/Palo Alto, whose benefit from Valley Water activities (if it exists at all) is so small that it could not be demonstrated in the Zone of Benefits study, should pay the same fee as others who receive benefits of 100 feet or more? There are multiple orders of magnitude difference in benefits (assuming a benefit even exists), which was not denied by Valley Water or its consultants at the meeting, and the benefits received by Stanford/Palo Alto effectively have no benefit to their respective well operations. In fact, any incremental benefit of Valley Water activities, if it does exist, is likely detrimental in the Palo Alto area where dewatering operations are common due to shallow groundwater levels.*

2. In response to LSCE Comment 1, Valley Water states, "The Todd model is not a local model. It is based on Valley Water's Santa Clara Plain groundwater model…"

   ***LSCE Response:***
   *Stanford/LSCE has previously commented extensively (in May 2018) on Valley Water's Santa Clara Plain groundwater model. Valley Water has elected not to respond to those comments, and noted in its letter dated August 21, 2019 that the groundwater model is not being relied upon to demonstrate a benefit in the Stanford/Palo Alto area. Given that the Todd Model is just a slightly revised version of the Santa Clara Plain groundwater model, those previous comments remain applicable and unaddressed. Thus, the groundwater model cannot be relied upon to demonstrate a benefit in the Stanford/Palo Alto area.*

3. In response to LSCE Comment 2, Valley Water attempts to cite a rationale for why the water level recovery from 1962 until the mid-1980s is no longer influenced after the mid-1970s by reductions in pumping by Palo Alto and Stanford that occurred from 1962 to 1973.

***LSCE Response:***
*There are a couple key points of clarification here. While Valley Water cites a decrease in Stanford pumping from "1,000 AFY to less than 500 AFY", the reality is that pumping declines from as much as 2,100 AFY to less than 500 AFY after 1973. The average Stanford pumping from 1963 to 1973 was 1,700 AFY, whereas the average Stanford pumping from 1974 to 1982 was 130 AFY. Thus, the abrupt decline in Stanford groundwater pumping amounted to more than 1,500 AFY of decreased groundwater pumping after 1973. Furthermore, this amount of pumping by Stanford extended back in time to the late 1940s, or a time period of approximately 25 years. Basic hydrogeologic principles dictate that it is not reasonable to expect full recovery of local groundwater levels from 25 years of significant pumping in less than five years. The second point is that LSCE was not saying all recovery after 1973 was due to Stanford pumping reductions alone; but rather a combination of even greater pumping reductions by Palo Alto that started in the 1960s plus reductions in pumping by Stanford that started in the 1970s. The combined total pumping reductions by Palo Alto and Stanford amounted to approximately 7,500 AFY during the 1960s and 1970s, a major change in the local pumping regime that was still causing local groundwater level recovery after 1977.*

4. In response to LSCE Comment 5, Valley Water states, "The District does not believe it is possible with the data and tools currently available to determine the comparative benefit…" Valley Water makes this same argument in response to LSCE Comment 6.

***LSCE Response:***
*If Valley Water were to address previous comments (and make appropriate model revisions) made by Stanford/LSCE in May 2018 on the groundwater model described in the ZOB study, the necessary tools and data would exist to delineate comparative benefits.*

5. In response to LSCE Comment 7, Valley Water argues that increasing groundwater levels in the late 1970s to early 1980s are due to Valley Water activities. In response to LSCE Comment 8, Valley Water notes that increases in precipitation result in a period not being valid for groundwater level evaluation in the ZOB study.

***LSCE Response:***
*While Stanford/LSCE strongly disagree with Valley Water conclusions regarding the cause of local water level recoveries in the Stanford/Palo Alto area with respect to changes in local pumping vs. Valley Water activities, there are other important data relevant to this discussion not previously addressed in the ZOB study. The attached figures (Figures 1 through 10) demonstrate that there was a severe drought in the three years immediately preceding 1978 (approximately 60% of normal rainfall), and then the 1978-1982 period had well above normal rainfall (approximately 120% of normal rainfall). These dramatic differences in rainfall would be expected to have significant effects on water levels during the 1978-82 period, and make this*

*time period invalid for ZOB study groundwater level evaluation. Overall, it is clear that dramatic declines in groundwater pumping by Palo Alto/Stanford in the 1960s/1970s and dramatic increases in rainfall from before to after 1978 account for the increases in groundwater levels in the Palo Alto/Stanford area from 1978 to 1982. Thus, the 1978-1982 time period cannot be used to demonstrate benefits from Valley Water activities in the Palo Alto/Stanford area.*

6. Valley Water's response to LSCE Comment 7 also states, "The contention that this period represents extended recovery conflicts with the observed rapid rise in groundwater levels in the early 1960s followed by flattening out of the recovery curve that occurred after the cessation of pumping in Palo Alto."

   ***LSCE Response:***
   *Valley Water is referring to the 1970-72 period when they reference flattening out of the recovery curve in this statement. However, the attached figures (Figures 1 through 10) clearly demonstrate 1970-72 was a very dry period with 60% of normal rainfall, which would account for any temporary flattening of water levels claimed by Valley Water. While temporary/intermittent fluctuations in groundwater levels may coincide with short-term fluctuations in rainfall, the overall trend of water levels in all the wells clearly shows no flattening of the trend from 1962 through 1983.*

7. In response to LSCE Comments 9 and 10, Valley Water acknowledges that the 2001-2004 and 2011-2013 time periods previously used for groundwater level evaluation in the Stanford/Palo Alto area are not valid periods for such an evaluation.

   ***LSCE Response:***
   *Stanford/LSCE concur with these updated findings/conclusions by Valley Water.*

8. In response to LSCE Comment 11, Valley Water states that hydrogeologic connection alone is sufficient to include Stanford/Palo Alto in the Zone of Benefits, and that the groundwater level evaluation and groundwater modeling efforts in the ZOB study go beyond what is necessary.

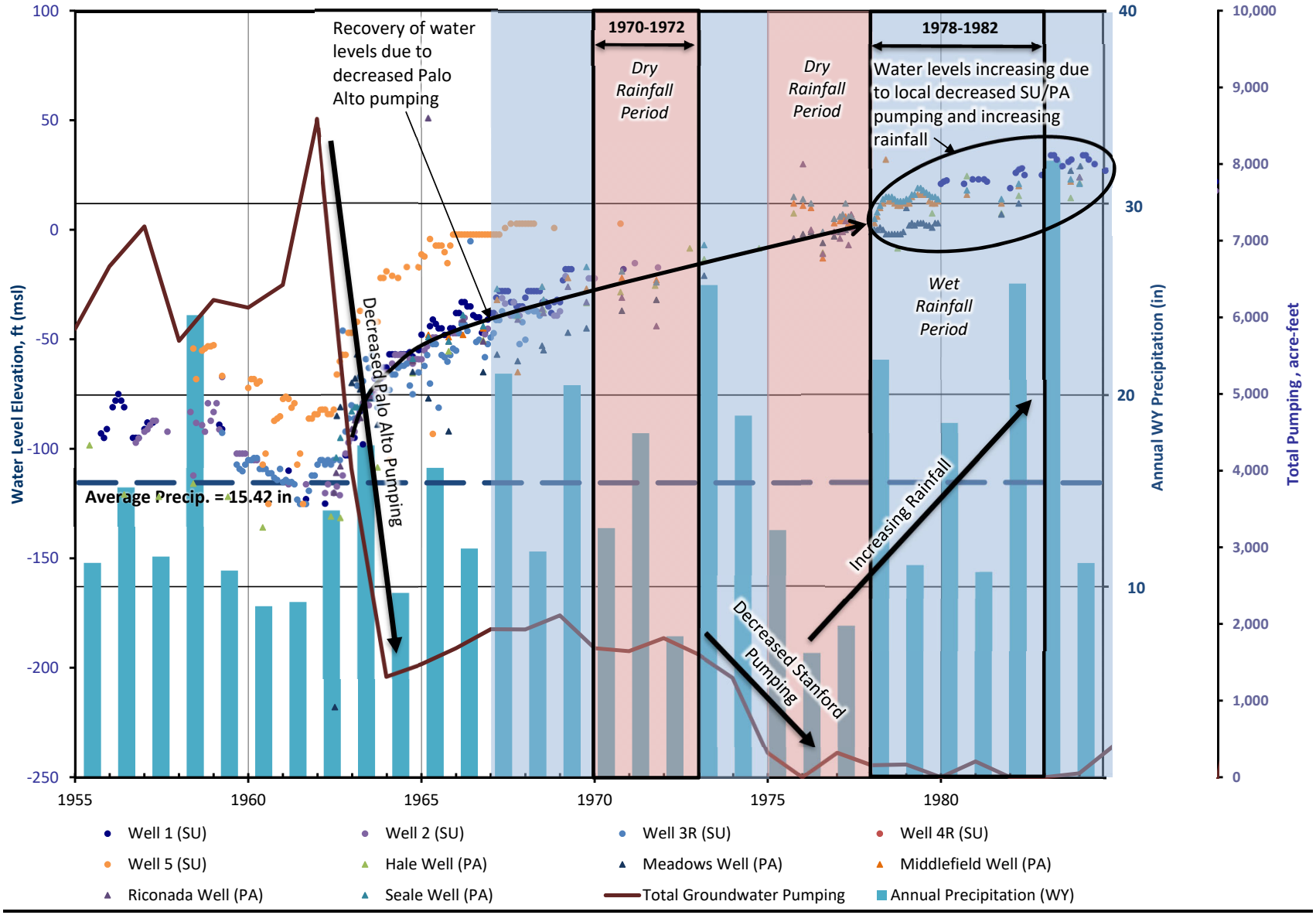
   ***LSCE Response:***
   *Valley Water has not evaluated the important characteristics of the San Francisquito Cone with regard to hydrogeologic connection. There are key geologic and hydrogeologic features of this alluvial cone relative to the discussion of hydrogeologic connection, most importantly the occurrence of abundant coarse-grained alluvial deposits that do not occur to the north or south of the San Francisquito Cone. In addition, this Valley Water response leads to a question posed in previous LSCE comments: what is the purpose of all the analyses related to groundwater modeling and groundwater level evaluation periods in the ZOB study if all that is needed to demonstrate a benefit is hydrogeologic connection?*

9. In response to LSCE Comment 15, Valley Water states that natural recharge from stream infiltration (in the absence of Valley Water activities) is accounted for in Chapter 6 of the report.

***LSCE Response:***

*Chapter 6 of the ZOB study provides no details as to how the natural recharge from streamflow infiltration was calculated. The primary recharge component during pre-development conditions in the Santa Clara Plain Subbasin was likely streamflow infiltration. If Valley Water managed recharge activities did not occur today, there would still be substantial natural recharge along the many streams flowing into Santa Clara Plain from the surrounding hills. While Valley Water activities certainly increase the amount of natural streamflow infiltration that would otherwise occur, it is likely that natural streamflow recharge is greater than what may be accounted for in the gross water budget numbers reported in Chapter 6 of the ZOB study.*

**Attachments: Figures 1 through 10**

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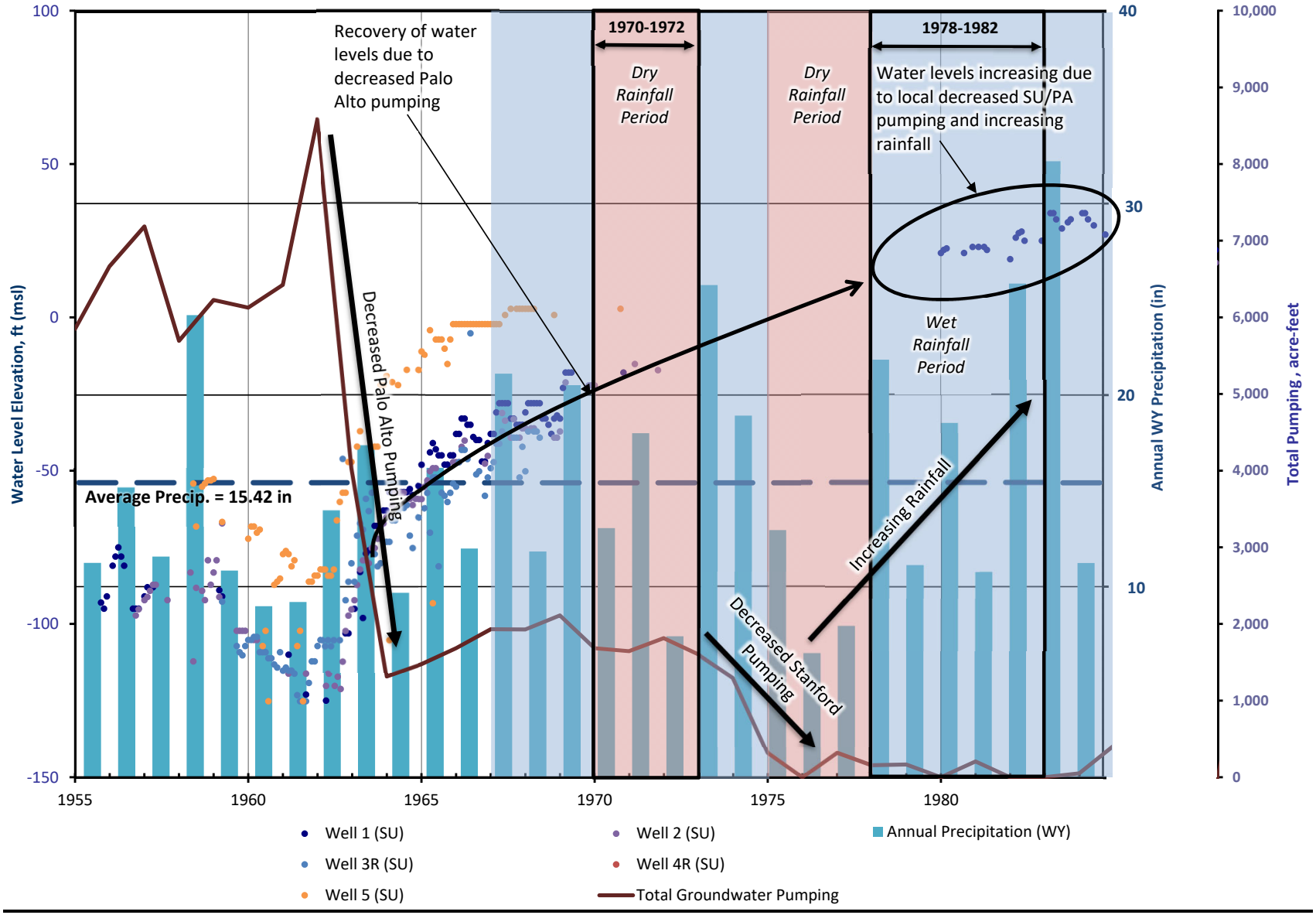
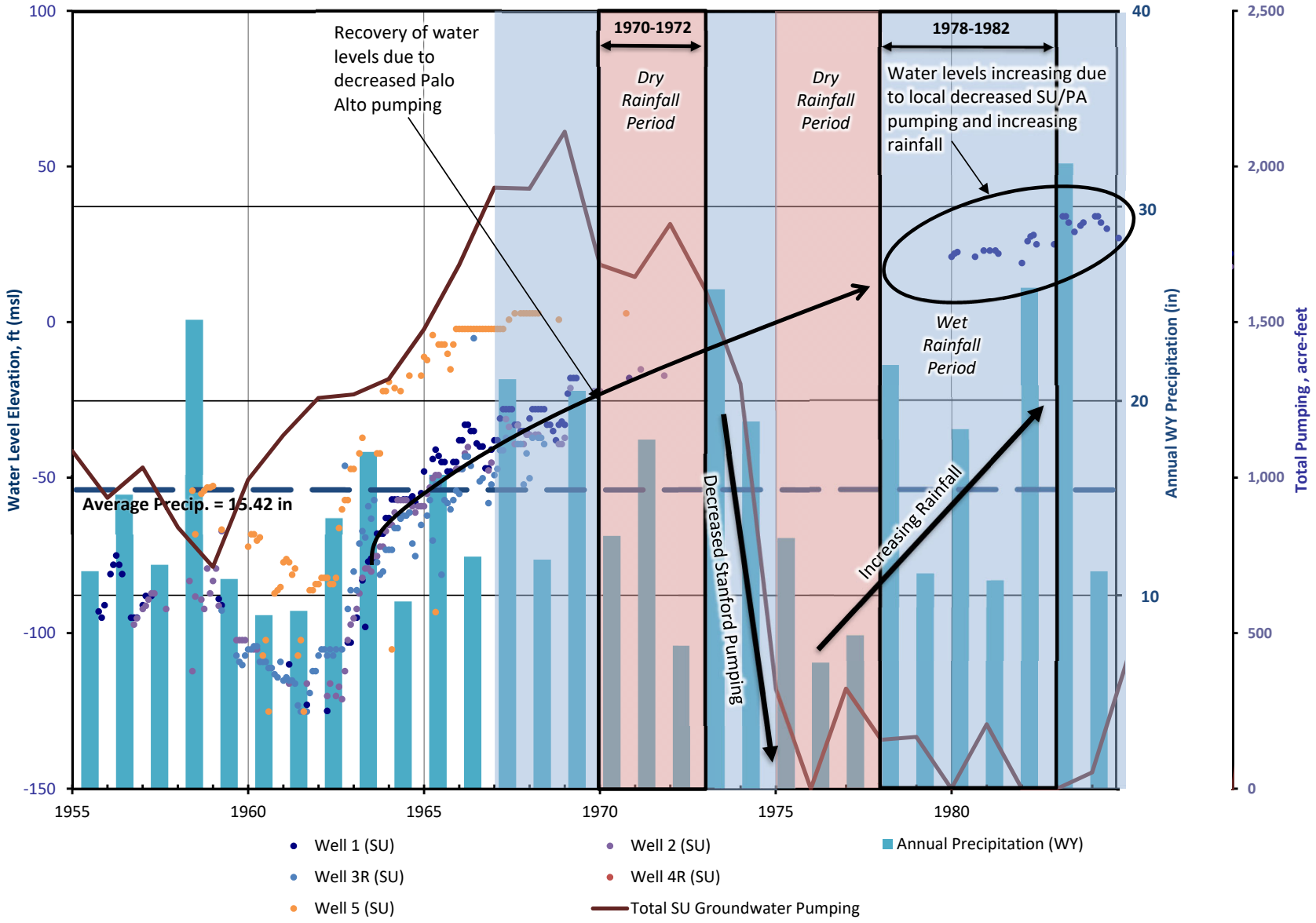
**Combined Wells Groundwater Level Elevations**
**Combined Stanford and Palo Alto Pumping**
**Figure 1**



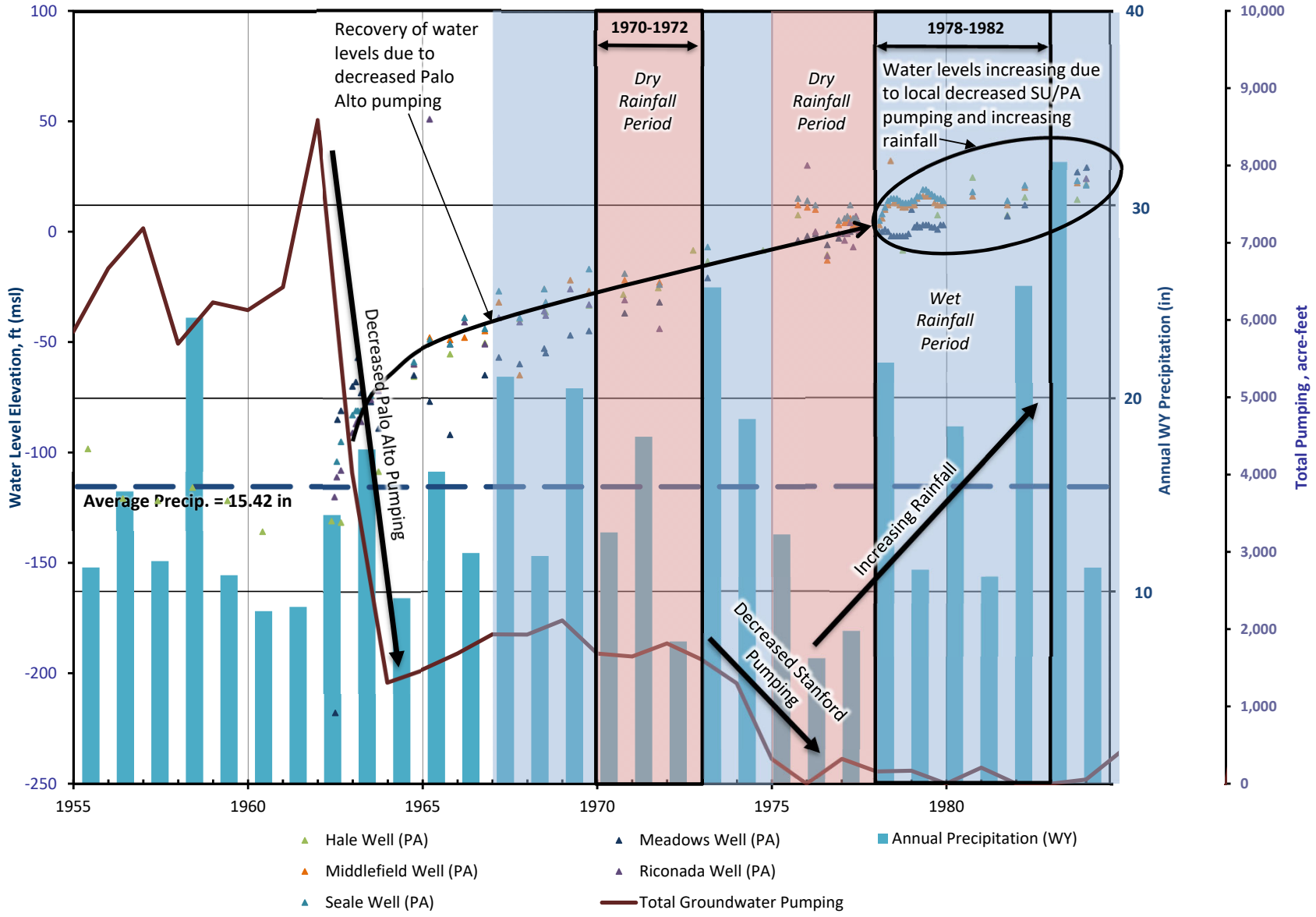

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Stanford Well Groundwater Level Elevations**
**Combined Stanford and Palo Alto Pumping**
**Figure 2**



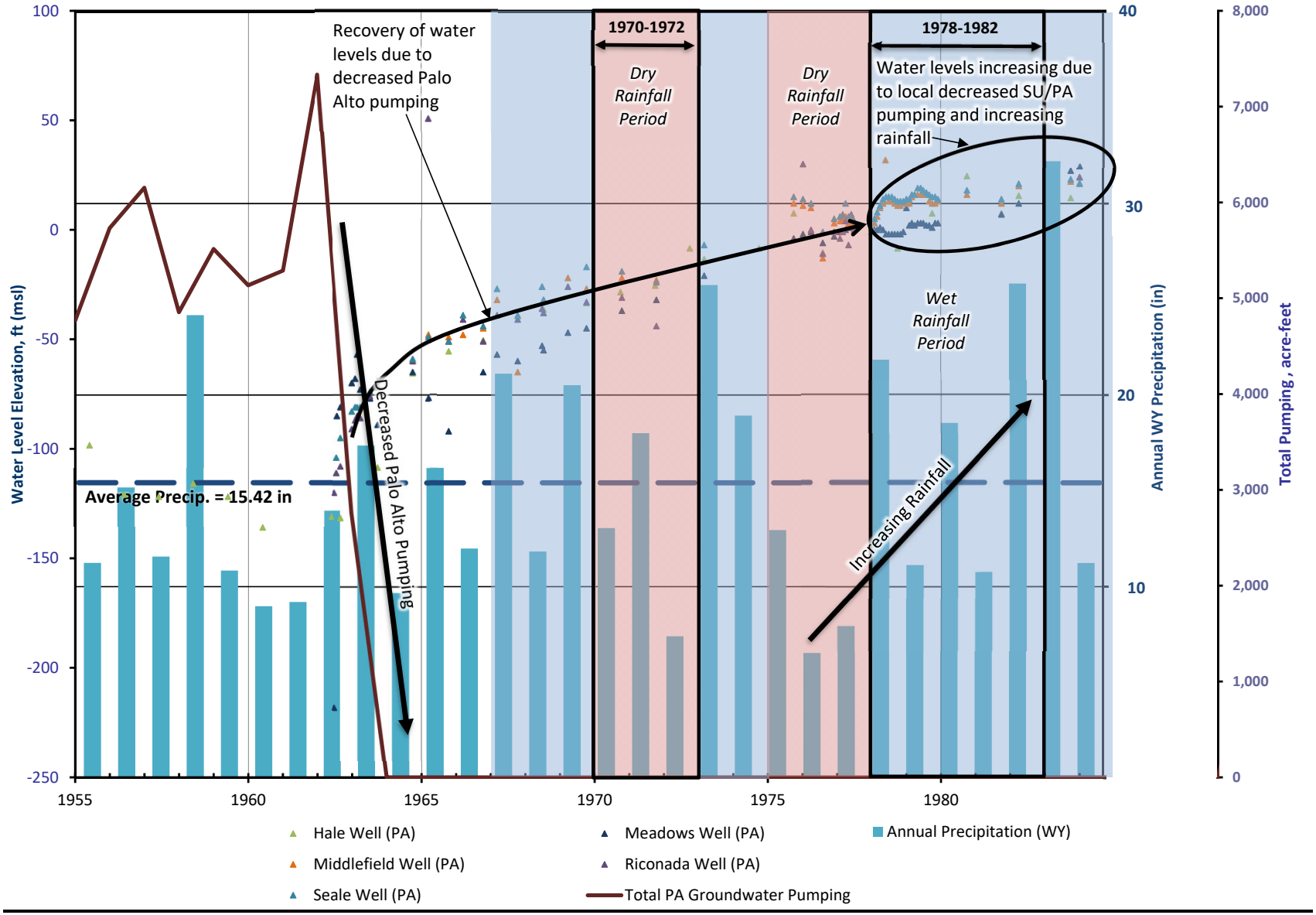

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Stanford Well Groundwater Level Elevations**
**Stanford Pumping**
**Figure 3**




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Palo Alto Well Groundwater Level Elevations**
**Combined Stanford and Palo Alto Pumping**
**Figure 4**

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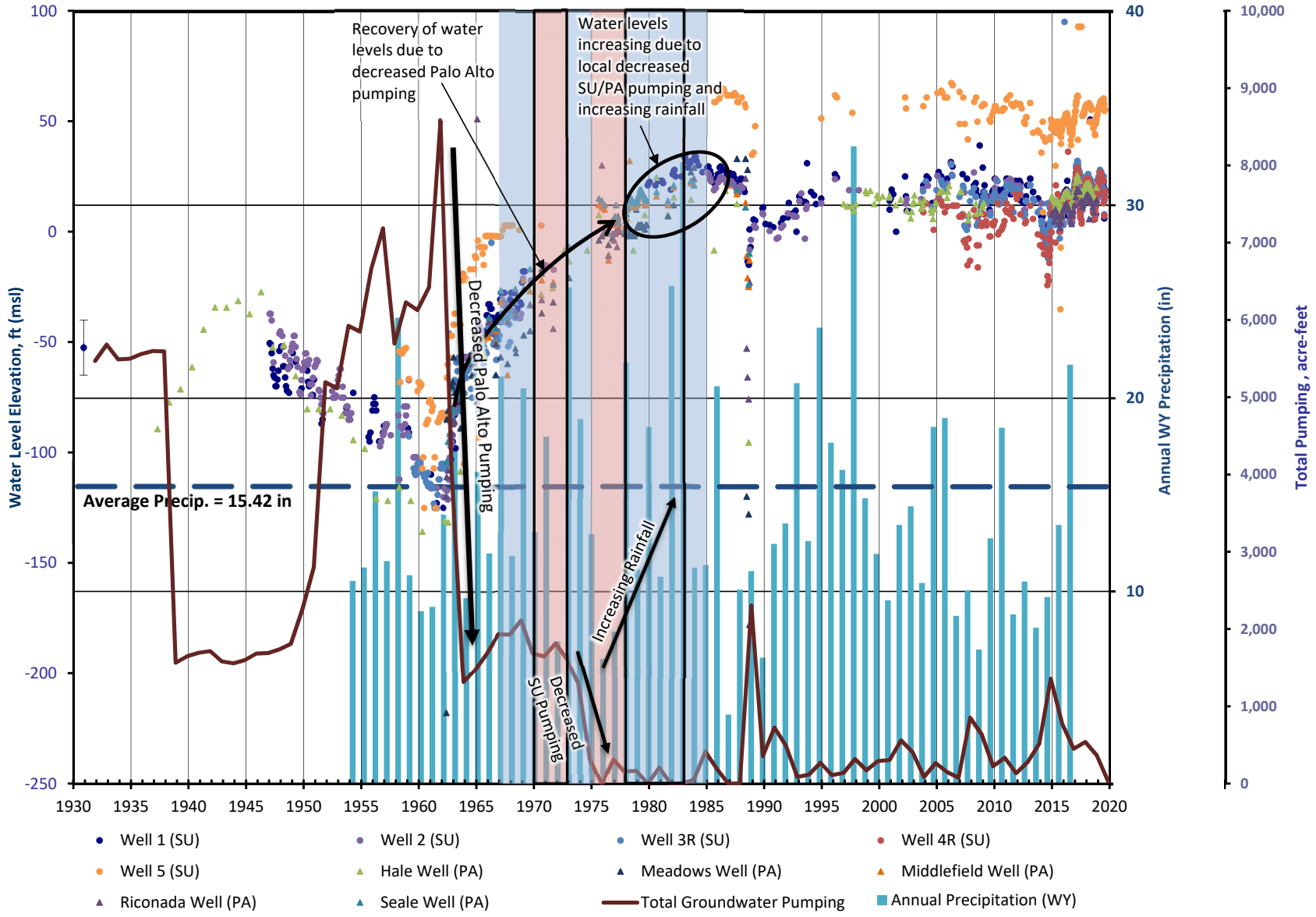
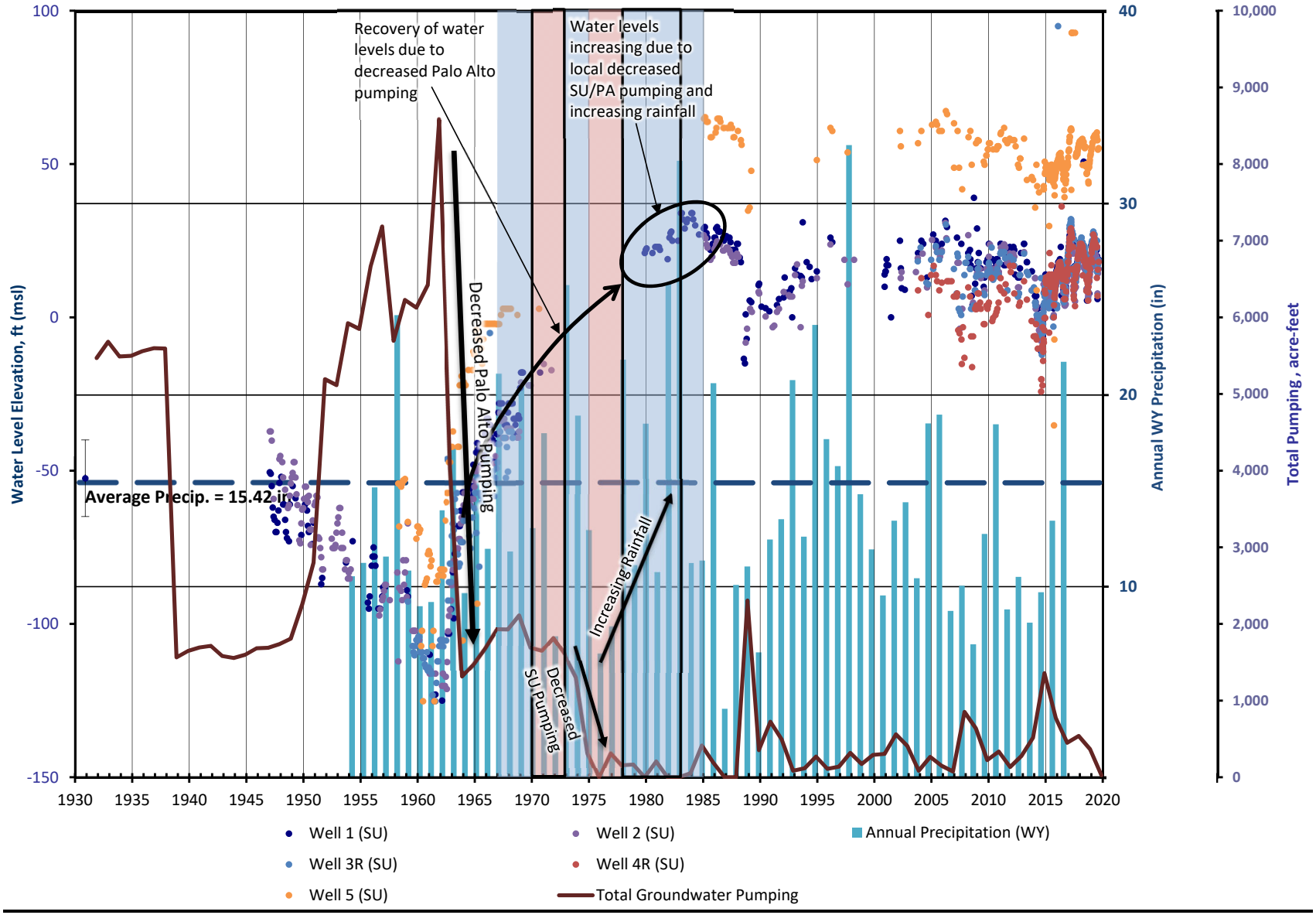
**Palo Alto Well Groundwater Level Elevations**
**Palo Alto Pumping**
**Figure 5**




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Combined Wells Groundwater Level Elevations**
**Combined Stanford and Palo Alto Pumping**
**Figure 6**

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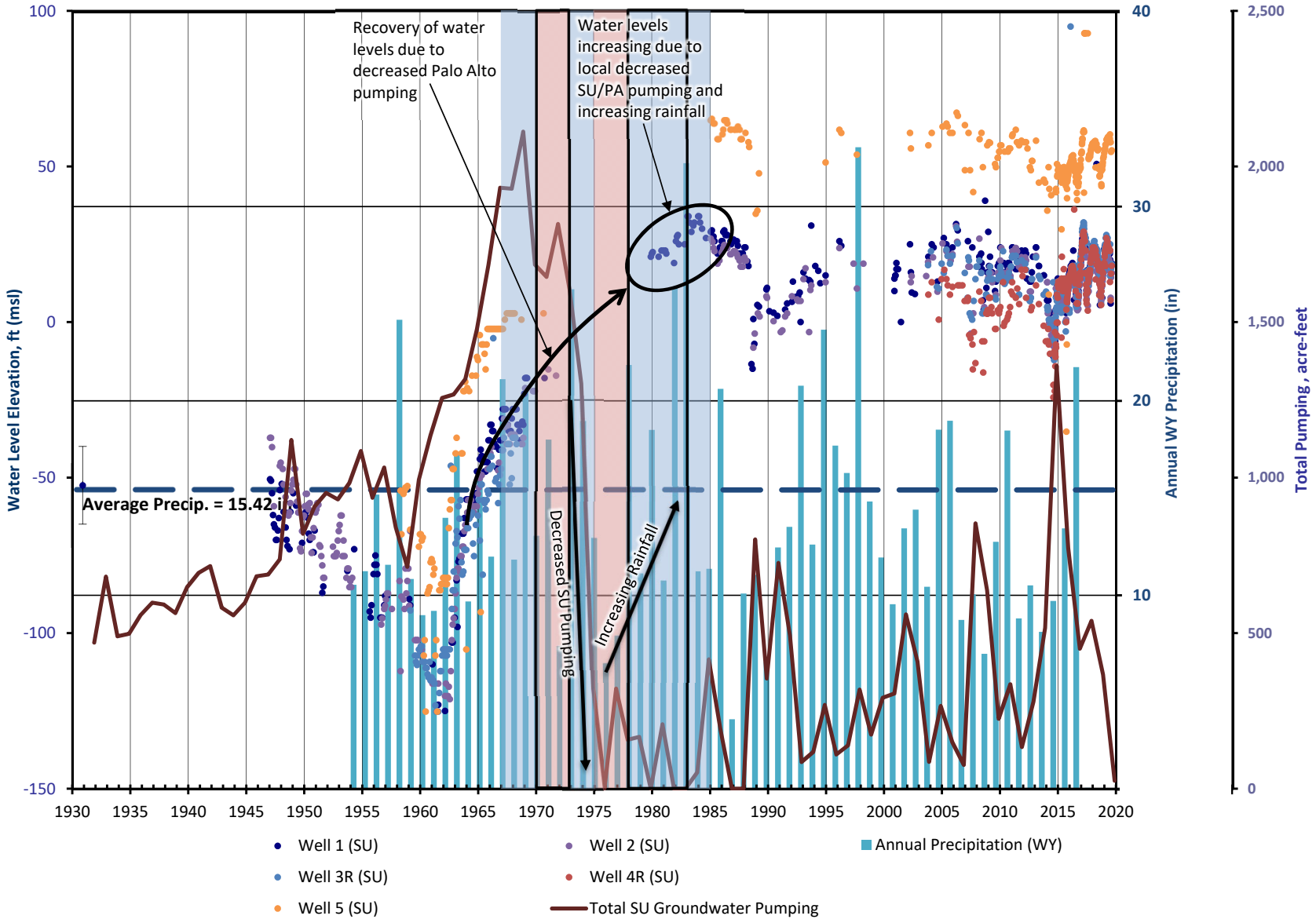
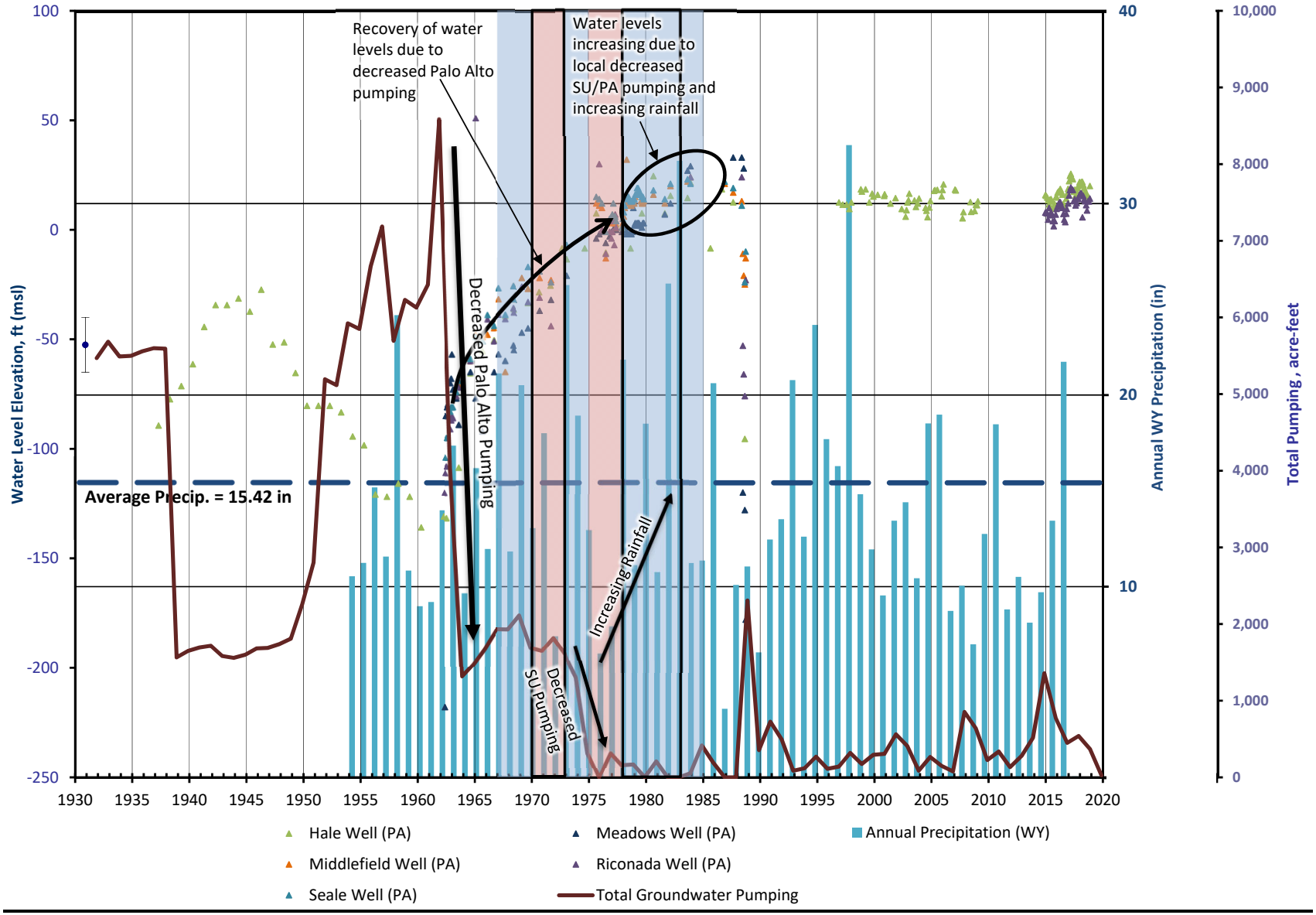
**Stanford Well Groundwater Level Elevations**
**Combined Stanford and Palo Alto Pumping**
**Figure 7**




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Stanford Well Groundwater Level Elevations**
**Stanford Pumping**
**Figure 8**

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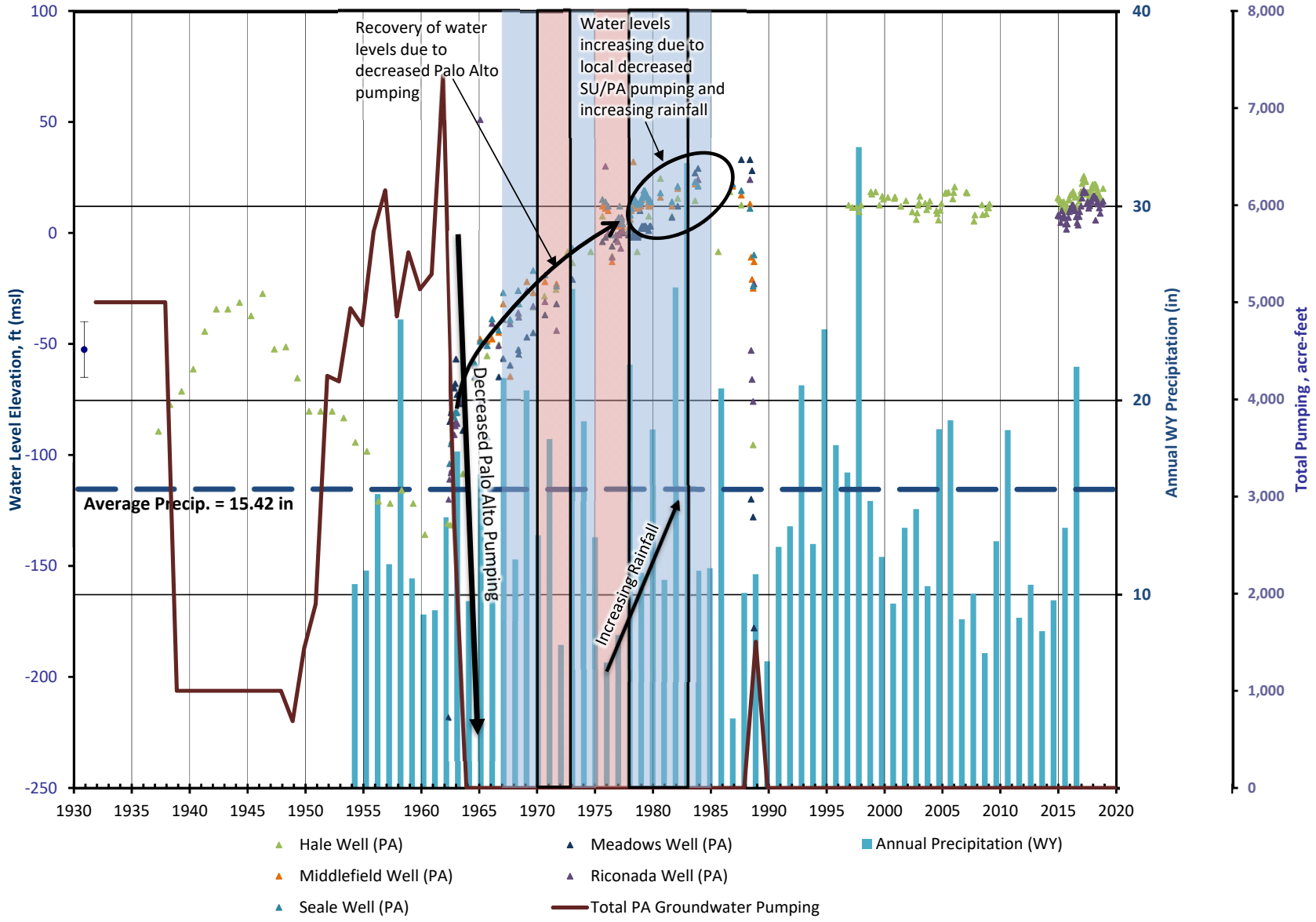
**Palo Alto Well Groundwater Level Elevations**
**Combined Stanford and Palo Alto Pumping**
**Figure 9**

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**Palo Alto Well Groundwater Level Elevations**
**Palo Alto Pumping**
**Figure 10**

# Stanford University

SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E., Unit Manager *via email to vdelapiedra@valleywater.org* April 24, 2020
Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

**Subject: April 28, 2020 Board of Directors Meeting – Agenda Items 2.3 and 2.4**

Dear Ms. De La Piedra:

Stanford University ("Stanford") offers these summary comments on agenda items 2.3 and 2.4 for the April 28, 2020 meeting of the Board of Directors ("Board") of the Santa Clara Valley Water District ("District"). As detailed in the staff reports and supporting documents for agenda items 2.3 and 2.4, those matters relate to the District's groundwater benefit zones and the Groundwater Benefit Zone Study ("Benefit Study") conducted by the District. For many years now Stanford and the District have been engaged in an ongoing discussion regarding the relative benefits to the Stanford and North County area from the District's activities in the Santa Clara Subbasin ("Subbasin"). As evidenced in Stanford's previously submitted comments and correspondence regarding the Benefit Study, Stanford disputes the District's position that the Stanford area benefits from District activities in the Subbasin and that Stanford is properly included in the District's Zone W-2. The technical evidence demonstrates that: (1) District activities in the southern portion of the Subbasin do not benefit groundwater conditions in the Stanford area; and (2) the activities and actions of Stanford and others in the northern portion of the Subbasin (e.g., importation of surface water from the San Francisco Public Utilities Commission and reduced groundwater pumping) are responsible for maintaining and protecting groundwater conditions in the Stanford area. (See, Attachment A – hydrograph showing the impact of imported water projects on groundwater levels in the Subbasin.) With respect to the latter point, the technical evidence shows that total groundwater recharge in the Stanford area far exceeds the amount of groundwater supply pumping in the area (by Stanford and others). Stanford intends to meet with District staff to provide and discuss additional technical analysis related to the points noted above.

Stanford respectfully requests that the Board remove the Stanford area from District groundwater benefit zones and terminate groundwater production charges in the Stanford area. Further, Stanford requests that any resolution adopting the boundaries of a groundwater benefit zone include language providing for the future review and revision of the boundaries in accordance with hydrogeologic data supporting such review and revision.

Thank you for your consideration of this matter.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

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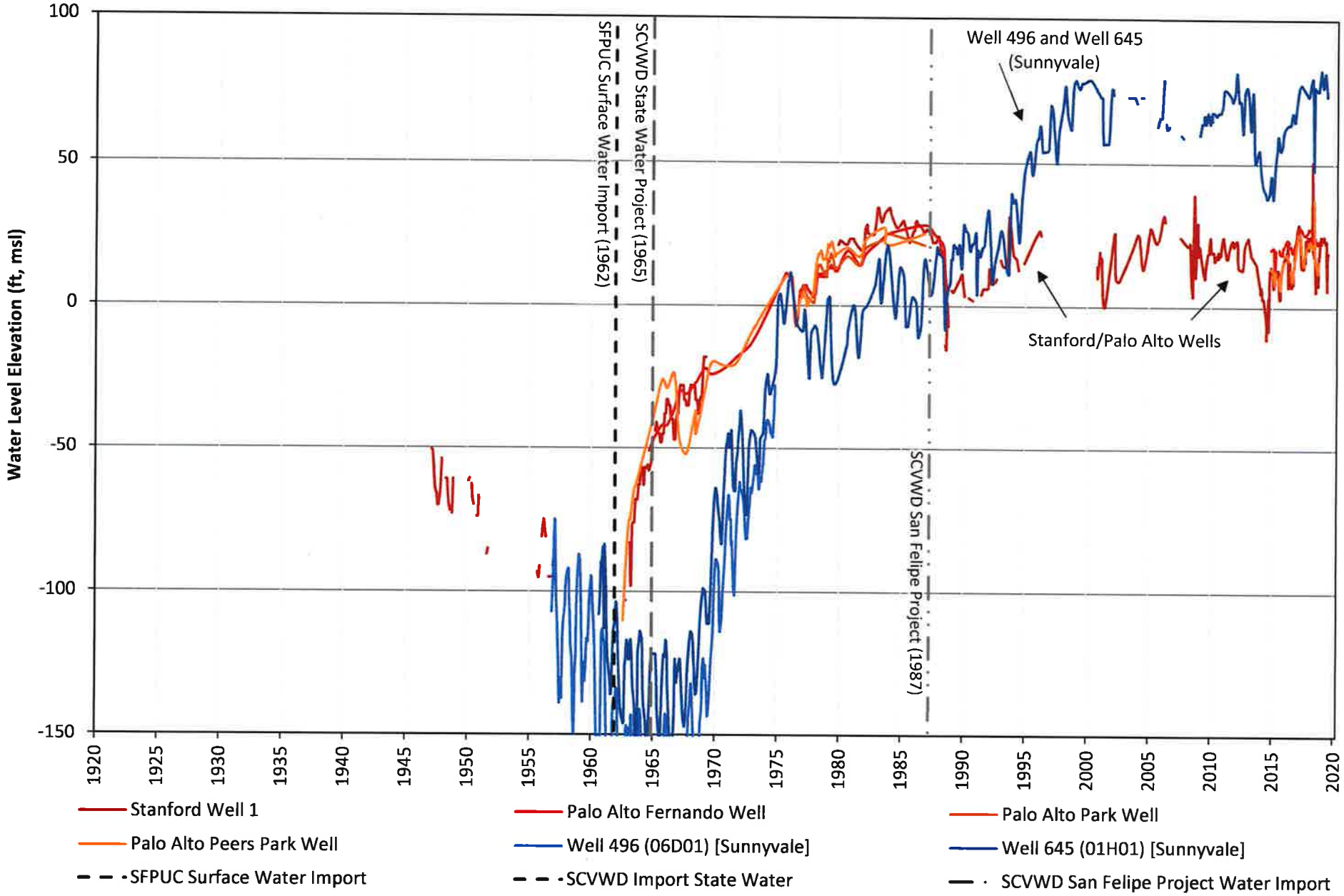
WATER RESOURCES & CIVIL INFRASTRUCTURE GROUP
315 Bonair Siding, Stanford, CA 94305-7272 T 650-725-8081 F 650-723-3191

# Attachment A: Impact of Imported Water Projects on Groundwater Levels




Handout 2.3-A & 2.4.A
04/2820

## Robert Donlan

**From:** Tom W Zigterman <twz@stanford.edu>
**Sent:** Thursday, May 7, 2020 2:01 PM
**To:** Vanessa De La Piedra; George Cook; Cameron Tana
**Cc:** 'Pete Leffler'; Julia Nussbaum
**Subject:** FW: Final TM
**Attachments:** TECH MEMO_May052020_Complete.pdf; SCVWD Grdwater fees PP May 5, 2020.pdf

Hi Vanessa, George and Cameron:
Thanks for meeting with us. Here are the Powerpoint and Technical Memo.
Look forward to continuing our discussions toward resolution.
-Tom

---

**From:** Pete Leffler <pleffler@lsce.com>
**Sent:** Thursday, May 7, 2020 1:29 PM
**To:** Tom W Zigterman <twz@stanford.edu>
**Subject:** Final TM

Hi Tom,

FYI…

**Peter Leffler**
**Principal Hydrogeologist**
Luhdorff & Scalmanini, Consulting Engineers
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Oakland, CA 94612
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Luhdorff & Scalmanini
Consulting Engineers

# Technical Memorandum

DATE: May 5, 2020 PROJECT: 19-6-130

TO: Rob Donlan
Ellison Schneider Harris & Donlan

FROM: Peter Leffler

SUBJECT: **EVALUATION OF LOCAL WATER BALANCE AND GROUNDWATER LEVEL FLUCTUATIONS, STANFORD UNIVERSITY**

## INTRODUCTION

Santa Clara Valley Water District's (SCVWD or District) recent update to their Zones of Benefit study incorporates Stanford University and the North County area. Stanford University and Palo Alto, which rely on San Francisco Public Utilities Commission (SFPUC) for their water supplies, are charged the same pumping fees as other groundwater users located farther to the south near SCVWD facilities. Our review of and comments on multiple drafts of the Zones of Benefit (ZOB) study indicated the benefits to the North County area were not properly characterized. Since the ZOB report preparers have not adequately addressed our review comments in revisions to the ZOB study, this Technical Memorandum (TM) provides detailed information that was not included in the SCVWD ZOB study and which supports the finding that benefits from District activities do not extend to the Stanford area.

## BACKGROUND AND PURPOSE

Santa Clara Valley Water District issued a draft report entitled, "Preliminary Zones of Benefit Study, Santa Clara County, California," prepared by HydroMetrics/Montgomery & Associates and dated October 2017. The Zones of Benefit study concluded that the Stanford and Palo Alto areas in the northernmost portion of Santa Clara County receive benefits from SCVWD activities that warrant imposition of a pumping fee, or a fee that is equal to the pumping fee charged to others located farther to the south (e.g., pumpers in Santa Clara and San Jose). Stanford University and Luhdorff & Scalmanini Consulting Engineers (LSCE) reviewed this study and provided comments in a letter dated May 11, 2018 from Stanford University (with attachment from LSCE dated May 7, 2018). LSCE disagreed with the technical conclusions reached in the ZOB study regarding groundwater benefits accruing to the North County area from SCVWD activities, which largely occur much farther to the south (i.e., on the order of ten or more miles away). A meeting was held between SCVWD and Stanford University representatives to further discuss Stanford's concerns and comments. SCVWD responded to the Stanford/LSCE draft

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ZOB study report study comments in a letter dated November 20, 2018 (with Montgomery & Associates (Montgomery) attachment dated October 26, 2018). SCVWD and Montgomery also prepared a revised draft report entitled, "Preliminary Groundwater Benefit Zones Study, Santa Clara County, California," dated April 2019. A LSCE TM dated June 28, 2019 provided responses to the November 20, 2018 letter from SCVWD (which includes the October 26, 2018 letter from Montgomery) and LSCE's comments on the revised draft report dated April 2019.

At the SCVWD August 27, 2019 Board Meeting, SCVWD Staff was directed to meet with Stanford, Palo Alto, and Great Oaks Water Company to further discuss their respective concerns with the ZOB study. This meeting took place on September 16, 2019; however, the technical and policy concerns expressed by Stanford University representatives (including LSCE) and others (along with suggested alternatives to define zones of benefit) were dismissed by SCVWD Staff and Montgomery. SCVWD Staff reported back to the SCVWD Board on October 8, 2019 and recommended that the zones of benefit as defined in the Montgomery ZOB study should move forward; the Board concurred with Staff recommendations.

As a result of SCVWD Staff and Board actions, the study documented in this TM was conducted to provide more detail regarding historical and current groundwater conditions in the north county area. The results provide more clarity and demonstrate more definitively that SCVWD activities in the southern portion of the groundwater basin do not accrue to the north county area in general and at Stanford in particular This is demonstrated in two ways. First, through a disaggregation of water balance components in the Stanford/Palo Alto area, it is shown that Stanford's pumping is well within the sustainable yield using local recharge sources. And second, historical fluctuations in groundwater levels in relation to the three major historical surface water importation events in the Santa Clara Plain Groundwater Subbasin show that Stanford University/Palo Alto and other northern cities recovered from over pumping solely through their use of SFPUC system water made first available in 1962. The ZOB study does not incorporate these relevant factors contradicting conclusions that District activities provide benefits throughout the basin including in the Stanford/Palo Alto area.

## EVALUATION OF THE WATER BALANCE

As an initial step in evaluating the water balance for the Stanford/Palo Alto area, previous studies were reviewed. It was determined that a detailed water balance study had recently been conducted for the City of Palo Alto and SCVWD (now known as Valley Water) for an area encompassing from the southern portion of Redwood City on the north to the southern boundary of the City of Mountain View on the south (**Figure 1**). The water balance study was completed in November 2018 and encompassed the area of interest for this TM; this TM reviewed that study as described below.

### City of Palo Alto (2018) Indirect Potable Reuse Study – Contemporary Water Balance

A contemporary water balance is presented in the City of Palo Alto/SCVWD study entitled, Groundwater Assessment, and Indirect Potable Reuse Feasibility Evaluation and Implementation Strategy, Northwest County Recycled Water Strategic Plan, dated November 2018 (referred to hereafter as Palo Alto IPR Study or IPR Study). The water balance represents annual flows under, "…*land and water use conditions*

*of the past decade and averaged over a series of years when average rainfall equaled the long-term average."* The study period of 1985 through 2014 was selected based on analysis of cumulative departure plots for annual rainfall at Redwood City and San Jose. A recharge simulation model was used to calculate certain components (rainfall and irrigation percolation) of the water balance. A total of 740 individual recharge zones were delineated based on intersection of the following variables: groundwater basins, watersheds, city boundaries, water purveyor service areas, wastewater collection areas, land use categories, and rainfall zones. Various other methods were used to calculate water balance components not estimated by the recharge simulation model (e.g., streamflow percolation, pipe leaks, bedrock inflow, groundwater pumping).

The following sections summarize water inflows and outflows from the Palo Alto IPR Study, which are then employed to evaluate the water balance components in the Stanford/Palo Alto study area that is the subject of this TM.

## Inflows

Average annual inflows to the study area were estimated to be a total of 17,400 acre-feet per year (AFY) for the various recharge components. This estimate incorporates inflows from deep percolation, pipe leaks, stream percolation, and subsurface inflow.

### Rainfall Percolation

Three land cover categories were mapped for rainfall percolation analysis: impervious, irrigated, non-irrigated. Rainfall infiltration into the soil was calculated by subtracting interception and runoff losses from rainfall. Impervious areas can either be "connected" – if runoff flows to a drainage system that removes it from the study area with little to no opportunity for infiltration – or "disconnected" – if runoff flows to adjacent pervious soils and largely infiltrates. Connected impervious areas decrease groundwater recharge, while disconnected impervious areas increase groundwater recharge. The Palo Alto IPR report stated, "*When simulated soil moisture exceeds the soil moisture storage capacity, the excess is assumed to become deep percolation, and all of the deep percolation was assumed to become groundwater recharge."* Average annual rainfall recharge on non-irrigated lands and from disconnected impervious areas was estimated to be 3,800 AFY. Recharge on irrigated lands within the Palo Alto IPR Study Area averaged 5,800 AFY, which derived from a combination of rainfall infiltration and deep percolation of irrigation water (described further below).

### Irrigation Deep Percolation

An irrigation event is triggered in the recharge model when simulated soil moisture falls below a specified percentage. Irrigation efficiency was assumed to be 75% for residential and commercial land uses, and the other 25% of applied water was assumed to become deep percolation (10%) and runoff into storm drains (15%). Average annual irrigation was estimated to be 13,300 AFY, with approximately 2,000 AFY becoming deep percolation. Deep percolation is included in the 5,800 AFY of irrigated lands recharge described in the previous section.

## Water and Sewer Pipe Leaks

Water system distribution system leakage was estimated based on recent updates to local Urban Water Management Plans (UWMPs). For those purveyors whose service areas intersected the Palo Alto IPR Study Area, estimated system leakage ranged from 0.5% to 4.4% of delivered water. Trees were assumed to intercept one-third of annual leakage, while the remainder became groundwater recharge. Average annual groundwater recharge from water pipe leaks in the Palo Alto IPR Study Area was estimated to be 1,800 AFY.

Sewer pipe leakage was estimated by first calculating indoor water use, where only 2% is consumed and the rest leaves as wastewater in drains. The rate of sewer pipe leakage was assumed to be half the water pipe leak rate. Average annual groundwater recharge from sewer pipe leaks in the Palo Alto IPR Study Area was estimated to be 400 AFY.

## Streamflow Percolation

San Francisquito Creek has received the most study of all streams and creeks located in the water balance study area. Flow losses calculated along San Francisquito Creek in 2017 suggest that percolation conditions have not changed substantially over the past 20 years (since the US Geological Survey (USGS) 2002 study encompassing data from 1996-1997). As a result, the USGS estimated annual groundwater recharge from percolation along San Francisquito Creek was used in the water balance.

The amount of percolation for the remaining creeks in the Palo Alto IPR study area were estimated based on various methods depending on available data for each stream. Steven's Creek infiltration was estimated based on the SCVWD facility recharge database. Infiltration in other creeks was based on infiltration equaling the lesser of daily stream flow and percolation capacity. Percolation capacity rates for smaller streams were assumed to be 0.3 to 0.4 cubic feet per second (cfs) per mile based on previous SCVWD studies. The overall groundwater recharge from stream percolation was estimated to be 4,300 AFY.

## Subsurface Inflow

Subsurface inflow was considered along the northwest, northeast, southeast, and southwest sides of the water balance study area. After a review of fall 2010 shallow and deep groundwater elevation contours, it was determined that there was little to no flow across the northwest boundary of the study area. A review of recent groundwater elevation contours determined that flow across the southeast study area boundary was close to zero. Shallow and deep groundwater level contours indicate flow along the northeast boundary is to the Bay. The southwest boundary of the study area is the contact between the unconsolidated alluvial deposits or semi-consolidated Santa Clara Formation and bedrock units, for which groundwater inflow (i.e., bedrock inflow) was estimated to be 900 AFY from fractured bedrock.

**Table 1: Summary of Palo Alto IPR Study Area Recharge Components**

| Inflows | Average Annual (AFY) | Proportion of Total Recharge | Comments |
|---|---|---|---|
| **Precipitation and Irrigation Recharge** | 9,600 | 55% | Based on soil moisture balance model. Results summarized in Figure 3-40 of IPR Report. |
| **Stream Recharge** | 4,300 | 25% | Includes stream infiltration from 10 Creeks summarized in Table 3-11 of IPR Report. |
| **Water Pipe Leaks** | 1,800 | 10% | Based on water pipe leak calculations summarized in Table 3-7 or IPR Report. |
| **Sewer Pipe Leaks** | 400 | 2% | Based on sewer pipe leak calculations summarized in Table 3-8 or IPR Report. |
| **Lake Lagunita Recharge** | 400 | 2% | Based on estimated recharge in Table 3-5 of IPR Report (uses data since 2002 only). |
| **Bedrock Inflow** | 900 | 5% | Average annual total recharge (from recharge simulation model) in zones adjacent to basin but not near creeks. |
| **Groundwater Inflow from Santa Clara Plain** | 0 | 0% | Based on groundwater elevation contour maps. |
| **Groundwater Inflow from San Mateo Plain** | 0 | 0% | Based on groundwater elevation contour maps. |
| **Recharge Total** | 17,400 | | |

## Outflows

Average outflows from the Palo Alto IRP Study area were estimated to be 17,400 AFY. This estimate incorporated groundwater discharges related to groundwater extraction, groundwater seepage, and subsurface outflow.

### Groundwater Supply Pumping

In the Santa Clara Plain Subbasin, all groundwater pumpers are required to report their pumping amounts to the SCVWD. In the San Mateo Plain, groundwater pumping was estimated based on simulated annual applied irrigation water and estimates from previous studies. Estimates for groundwater supply pumping were provided in Table 3-12 with well locations shown in Figure 3-42 of the Palo Alto IPR Study. Review of IPR Figure 3-42 indicates irrigation pumping in the San Mateo Plain north of San Francisquito Creek and within the Stanford University area south of San Francisquito Creek, concentrated areas of domestic/irrigation pumping north of San Francisquito Creek with a significant number but sparser distribution of domestic irrigation wells south of San Francisquito Creek, and municipal/industrial pumping with two major pumpers in San Mateo Plain and numerous smaller pumpers in the Santa Clara Plain.

Groundwater supply pumping is divided into irrigation, domestic/irrigation, and municipal/industrial categories. Major individual groundwater supply pumpers for the San Mateo Plain portion of the IPR study area (i.e., north of San Francisquito Creek) included Palo Alto Park Mutual Water Company (523

AFY) and O'Connor Tract Cooperative Water Company (325 AFY) in the municipal/industrial category. Some of the major irrigation pumpers include: Menlo College (80 AFY), U.S. Veterans Administration Hospital (64 AFY), St. Patrick's Seminary (19 AFY), and USGS (11 AFY). Various user groups include Atherton homeowners' landscape irrigation (545 AFY), irrigation by residents near Atherton (190 AFY), landscape/athletic field irrigation for various institutions in Atherton (120 AFY), irrigation by cities or individuals in Santa Clara County by 19 wells (739 AFY), domestic/irrigation use by Santa Clara County homeowners from 191 wells (176 AFY), and municipal pumping by cities, purveyors, and remediation sites in Santa Clara County from 380 wells (2,715 AFY). Average annual groundwater supply pumping was estimated to be 5,500 AFY under current land use and water supply conditions.

### Groundwater Remediation System Pumping

In the Santa Clara Plain Subbasin, remediation pumping is provided in the SCVWD's production data. In the San Mateo Plain Subbasin, remediation pumping was estimated from information on discharge permits. The total average annual groundwater remediation pumping was estimated to be 1,100 AFY, with the majority occurring within Santa Clara Subbasin.

### Dewatering Pumping

Documentation of dewatering appeared to be more systematic and quantitative in Palo Alto than in other areas, where it appeared that dewatering was being underreported. As a result, dewatering pumping in San Mateo County and Mountain View was estimated as half the reported value in Palo Alto. Average annual dewatering pumping for the water balance study area was estimated to be 1,600 AFY.

### Use of Groundwater by Riparian and Wetland Vegetation

The area of tree canopy along stream channels in the water balance study area was estimated based on review of aerial imagery. Consumptive use of groundwater was estimated based on the difference in simulated actual evapotranspiration (ET) under two hypothetical model scenarios: one in which the zone is completely non-irrigated and one in which the zone is completely irrigated. The average annual use of groundwater by riparian vegetation was estimated to be 500 AFY. ET needs of tidal wetlands are assumed to be met by Bay water.

### Groundwater Discharge to Surface Waters

Groundwater in the water balance study area generally flows toward the Bay where the water table becomes increasingly shallow. Near the Bay, groundwater may seep into creek channels, sewers, and storm drains. While groundwater seepage into sanitary sewers can be estimated from available data, few data are available to quantify seepage to other pathways. The report stated that, "*Groundwater outflow to creeks, storm drains, tidal wetlands and subsurface flow toward Niles Cone were collectively estimated as the residual in the water balance Two-thirds of the estimate was assigned to discharge to creeks and storm drains, with the remaining third assigned to tidal wetlands and Niles Cone.*" Groundwater discharge to sewers was estimated as 2,000 AFY, while discharge to creeks and storm drains was estimated as 4,500 AFY.

### Subsurface Outflow

As described previously, there is little to no subsurface flow along the northwest and southeast boundaries of the subbasin. There is no groundwater outflow along the southwest boundary as gradients are from the bedrock uplands toward the groundwater subbasins. Subsurface outflow probably occurs along the northeast boundary, and this outflow was assigned one-third of the residual in the water balance (2,200 AFY), while the remaining two-thirds was assigned to groundwater discharge into creeks and storm drains.

**Table 2: Summary of Palo Alto IPR Study Area Discharge Components**

| Inflows | Average Annual (AFY) | Proportion of Total Discharge | Comments |
|---|---|---|---|
| **Water Supply Well Pumping** | 5,500 | 32% | Based upon estimated domestic/irrigation and municipal/industrial pumping summarized on Figure 3-42 and Table 3-12 of IPR Report. . |
| **Remediation Well Pumping** | 1,100 | 6% | Estimate from Santa Clara County pumping records (1,027 AFY) and small amount for San Mateo Plain area. |
| **Dewatering Well Pumping** | 1,600 | 9% | Calculated from detailed City of Palo records with proportional estimates for remaining areas. |
| **Riparian/Wetland ET** | 500 | 3% | Includes riparian ET from 10 Creeks listed in Table 3-13 of IPR Report. |
| **Seepage to Sanitary Sewers** | 2,000 | 11.5% | Estimates for three wastewater treatment plants/pump stations summarized in Figure 3-44 of IPR Report. |
| **Seepage to Creeks/Storm Drains** | 4,500 | 26% | Two-thirds of water balance residual per IPR Report. |
| **Outflow to SF Bay** | 2,200 | 12.5% | One-third of water balance residual per IPR Report. |
| **Discharge Total** | 17,400 | | |

## Change in Storage

Average annual change in storage is assumed to be zero in the water balance. This conclusion is supported by groundwater levels, as levels in the water balance study area have not exhibited long-term upward or downward trends in the past 20 years.

## Water Balance Summary, Uncertainty, and Variability

The Palo Alto IPR Study indicates the major sources of recharge are dispersed recharge from rainfall and irrigation (55% of total recharge), percolation from creeks (25%), and pipe leaks (13%). The major outflows are pumping at wells (47% of total discharge), seepage into creeks and storm drains (26%), subsurface flow to San Francisco Bay and Niles Cone (13 %), and seepage into sanitary sewers (11%). Certain water balance parameters (such as those dependent on rainfall) can vary dramatically from year to year. There is uncertainty in the estimates for most water budget items; in some cases, the estimated

value may have an uncertainty as large as +/- 50 percent. These uncertainties are consistent with the current state of the art and standard hydrogeologic practice. Given that the water balance study period had relatively steady water levels and no significant change in storage; uncertainties tend to be reduced in that individual uncertainties in recharge components would likely offset one another. Since discharge must equal recharge (since groundwater storage change is zero) and groundwater pumping in this water balance generally has less uncertainty than most other water balance components, the overall uncertainty in this water balance is likely less than may typically be the case.

## Stanford/Palo Alto Area Water Balance

The water balance from the Palo Alto IPR Study provides a sound basis for quantifying the water balance for the Stanford/Palo Alto area as examined in this TM (TM Study Area). The service areas for Stanford University and City of Palo Alto comprise the TM Study Area for the water balance discussed below (**Figure 2**). The larger Palo Alto IPR Study covered the area from the southern portion of Redwood City in the north to the southern edge of Mountain View in the south, which includes the southernmost portion of the San Mateo Plain Groundwater Subbasin and the northernmost portion of the Santa Clara Plain Groundwater Subbasin. This TM Study Area includes approximately the middle one-third of the Palo Alto IPR Study area, with San Francisquito Creek (and the County line) as the northern boundary and the southern edge of the City of Palo Alto service area as the southern boundary (**Figure 2**). Quantification of the recharge and discharge components of the water balance for this TM were primarily based upon information provided in the Palo Alto IPR report and are discussed below in the context of past, current, and future scenarios of groundwater pumping by Stanford.

### Recharge Components

One of the major recharge components is deep percolation through soils, which includes three components: rainfall-runoff on impervious areas, rainfall on nonirrigated areas, and irrigated areas. The total amount of recharge from these three components in the Palo Alto IPR report was 9,600 AFY, of which 2,600 AFY occurs within the Stanford/Palo Alto TM Study Area. The amount allocated for the TM Study Area was determined by evaluation of the dispersed recharge occurring within the Stanford University and Palo Alto areas as shown on Palo Alto IPR report Figure 3-40. This information is presented for the Stanford/Palo Alto Study Area in **Figure 3**.

A second major component of recharge is stream percolation, which includes a total of 4,300 AFY in the Palo Alto IPR Study area. The total amount of stream percolation occurring within the TM Study Area is estimated to be 1,400 AFY out of the 4,300 AFY estimated for the larger IPR area. The amount of stream percolation within the TM Study Area was calculated as half of the San Francisquito Creek recharge (northern boundary of TM Study Area, 100% of the stream percolation from Matadero and Barron Creeks (within the TM Study Area), and half of the stream percolation from Adobe Creek (on southern boundary of TM Study Area). The locations of the creeks occurring within the Stanford/Palo Alto TM Study Area are shown in **Figure 4**.

A third major component of recharge is leaks from water and sewer pipes. The total amount of pipe leaks estimated for the Palo Alto IPR Study area is 2,200 AFY. Based on Table 3-11 of the IPR report, the

total amount of water pipe leakage for Stanford and City of Palo Alto is approximately 650 AFY and total sewer pipe leakage is about 150 AFY; thus, a total pipe leakage of 800 AFY was estimated for the TM Study Area.

A fourth component of recharge specific to the Stanford portion of the TM Study Area is recharge from Lake Lagunita. The IPR report estimated 400 AFY of recharge from Lake Lagunita based on data since 2002. Available data from Stanford University indicates this value is too high, and that a more representative value for Lake Lagunita recharge is likely on the order of 200 AFY.

A fifth component of recharge is inflow to the TM Study Area from fractured bedrock adjacent to the west of the TM Study Area. A total estimate of 250 AFY is occurring into the TM Study Area out of a total of 900 AFY for the entire IPR area provided in Table 3-5 of the IPR report. The estimate of 250 AFY was obtained based on the length of the mountain front bordering the Stanford/Palo Alto TM Study Area relative to the length of the mountain from bordering the IPR area. The estimate of inflow from fractured bedrock in the Palo Alto IPR Study (and therefore, the TM Study area as well) may be an underestimate; however, it is utilized as a conservative estimate for the purposes of the TM Study Area water balance.

Overall, the recharge components to the Stanford/Palo Alto TM Study Area amount to 5,250 AFY as summarized in **Table 3**.

**Table 3: Summary of Stanford/Palo Alto Study Area Recharge Components**

| Inflows | Average Annual | Proportion of IPR Amount | Comments |
|---|---|---|---|
| **Precipitation and Irrigation Recharge** | 2,600 | 27% | Based on soil moisture balance model used in Palo Alto IPR Study. Includes dispersed recharge for Stanford/Palo Alto service areas from Figure 3-40 of IPR Report. |
| **Stream Recharge** | 1,400 | 33% | Includes 50% of stream infiltration from San Francisquito and Adobe Creeks, and 100% of stream infiltration from Matadero and Barron Creeks from Table 3-11 of IPR Report. |
| **Water Pipe Leaks** | 650 | 36% | Based on water pipe leak calculations for Stanford and Palo Alto in Table 3-7 or IPR Report. |
| **Sewer Pipe Leaks** | 150 | 37.5% | Based on sewer pipe leak calculations for Stanford and Palo Alto in Table 3-8 of IPR Report. |
| **Lake Lagunita Recharge** | 200 | 50% | Based on estimated recharge in Table 3-5 of IPR Report, corrected using Stanford data for minimum lake recharge. |
| **Bedrock Inflow** | 250 | 28% | Based on the amount estimate in Table 3-5 of IPR Report (900 AFY) prorated to the distance along the western boundary of the Stanford/Palo Alto study area. |
| **Recharge Total** | 5,250 | 30% | |

## Discharge Components

The groundwater pumping components are divided into three categories: water supply pumping, remediation well pumping, and dewatering well pumping. The locations and amounts of water supply pumping were provided in the IPR report, and pumping well locations for the Stanford/Palo Alto TM Study Area are summarized in **Figure 5**. The information provided in **Figure 5** was used to estimate groundwater pumping in the TM Study Area. The map information is summarized in **Table 4** using the mid-point of each pumping range. The results summarized in **Table 4** indicate 550 AFY of domestic/irrigation pumping and 500 AFY of municipal/industrial pumping. The irrigation pumping at Stanford University was estimated to be 800 AFY for the 2005-2014 time period based on information provided in the Palo Alto IPR Report; however, specific information available from Stanford University indicates the actual pumping over this time period averaged 450 AFY. Thus, the total irrigation pumping was adjusted to include actual Stanford University well pumping amounts, resulting in total irrigation pumping of 500 AFY. Based upon review of this information, the total water supply pumping within the Stanford University and City of Palo Alto area is estimated to be 1,550 AFY.

**Table 4: Groundwater Supply Pumping for Stanford/Palo Alto Study Area**

| Individual Well Pumping Amount (AFY) | Domestic / Irrigation Pumping (AFY) | Municipal / Industrial Pumping (AFY) | Palo Alto Irrigation Pumping (AFY) | Stanford Irrigation Pumping[1] (AFY) | Total Pumping (AFY) |
|---|---|---|---|---|---|
| **0-8** | 515 | 250 | 15 | NA | NA |
| **9-56** | 35 | 130 | 35 | NA | NA |
| **57-187** | 0 | 120 | 0 | NA | NA |
| **Total** | 550 | 500 | 50 | 450 | 1,550 |

[1] The IPR Report appears to overestimate total Stanford pumping, and meter records from Stanford were used instead of information provided n the IPR Report.

The IPR report estimates about 1,000 AFY of remediation pumping in the Santa Clara County portion of the IPR area, of which 500 AFY is estimated to occur within the Stanford University and City of Palo Alto TM Study Area. Pumping for dewatering is well quantified in the City of Palo Alto at 800 AFY, and dewatering well locations derived from the Palo Alto IPR report are shown in **Figure 6**.

Riparian/wetland ET was quantified in the IPR Report for the various creeks in the IPR Study area. Review of this information included in Figure 3-43 of the IPR report indicates that an estimated 250 AFY occurs within the TM Study Area. Seepage to sanitary sewers is quantified in Figure 3-44 of the IPR report; the total occurring within the TM Study Area was estimated at 1,450 AFY. The residual of the water balance (i.e., recharge – discharge = 0) is 700 AFY, which is proportioned as 450 AFY for seepage to creeks/storm drains and 250 AFY as outflow to San Francisco Bay.

Overall, the discharge components to the Stanford/Palo Alto TM Study Area amount to 5,250 AFY as summarized in **Table 5**.

**Table 5: Summary of Stanford/Palo Alto TM Study Area Discharge Components**

| Inflows | Average Annual | Proportion of IPR Amount | Comments |
|---|---|---|---|
| **Water Supply Well Pumping** | 1,550 | 28% | Based upon estimated domestic/irrigation and municipal/industrial pumping within Stanford/Palo Alto TM Study Area shown on Figure 3-42 of IPR Report. Stanford Irrigation pumping based on actual 2005-2014 records. |
| **Remediation Well Pumping** | 500 | 45% | Assumed to be approximately 50% of total remediation pumping in Santa Clara Plain. |
| **Dewatering Well Pumping** | 800 | 50% | Based on data collected for 2016 in Palo Alto, as shown on Figure 3-43 of IPR Report. |
| **Riparian/Wetland ET** | 250 | 50% | Includes 50% of riparian ET from San Francisquito and Adobe Creeks, and 100% of riparian ET from Matadero and Barron Creeks from Table 3-13 of IPR Report. |
| **Seepage to Sanitary Sewers** | 1,450 | 73% | Includes Palo Alto portion from Figure 3-44 of IPR Report. |
| **Seepage to Creeks/Storm Drains** | 450 | 10% | Two-thirds of water balance residual per IPR Report. |
| **Outflow to SF Bay** | 250 | 11% | One-third of water balance residual per IPR Report. |
| **Discharge Totals** | 5,250 | 30% | |

Review of the water balance for the Stanford/Palo Alto TM Study Area indicates that water supply pumping constitutes only about 30% of local recharge sources. Excess water in the TM Study Area is discharged primarily through dewatering pumping, seepage of sanitary sewers, and seepage to creeks/storm drains. The combined discharges of excess recharge water amount to 2,700 AFY, which equals 51% of the 5,250 AFY recharge total. Notably, the current study incudes no water balance contributions from Valley Water recharge facilities because there are no hydraulic relationships to Valley Water recharge facility areas as indicated through the groundwater level fluctuations analysis discussed below. Thus, the local water balance shows no deficit that might otherwise be allocated to Valley Water recharge activities.

The water balance for the Stanford/Palo Alto area demonstrates that water supply pumping could likely increase from current levels and remain within the sustainable pumping amount based on local recharge sources. An increase in water supply pumping would be balanced by corresponding reductions in groundwater discharges to dewatering pumping, seepage of sanitary sewers, and seepage to creeks/storm drains, thereby providing ancillary benefits in terms of less need for dewatering pumping and less inflow to wastewater treatment plants. There would likely be no measurable impact outside of the area since pumping in this area simply intercepts local recharge while reducing discharge components that ultimately reach the Bay.

## EVALUATION OF GROUNDWATER LEVEL FLUCTUATIONS

Groundwater level fluctuations were evaluated for several wells with relatively long periods of records to identify the extent of influences from historic water supply measures to alleviate over pumping in the Santa Clara Valley. The locations of these wells range from the Stanford University/City of Palo Alto TM Study Area on the north to the City of San Jose on the south (**Figure 7**). In the area of Stanford University and City of Palo Alto, there was a regional trend of increasing groundwater levels from 1962 to 1984 that resulted from greatly decreased pumping by Palo Alto/Stanford between 1962 (in excess of 8,000 AFY) and 1974 (less than 1,000 AFY) as a result of importation and use of SFPUC surface water as the primary source of water supply to northern Santa Clara County. More regionally (south of Stanford/Palo Alto to San Jose), importation of surface water supplies by Valley Water starting in 1965 (State Water Project) and then additional imported surface water supplies by Valley Water starting in 1987 (San Felipe Project) resulted in recovery of groundwater levels, particularly in areas centered around San Jose where over pumping induced significant subsidence and seawater intrusion up to the 1960s.

Groundwater hydrographs provide demonstrable evidence of recovery in specific locations in response to surface water availability at initiation of the three major imported water projects: 1) SFPUC Hetch Hetchy surface water in the northern portion of the subbasin in 1962, 2) State Water Project (SWP) surface water for the southern portion of the basin in 1965, and 3) Central Valley Project (CVP) San Felipe Division surface water for the southern portion of the subbasin beginning in 1987. These projects were implemented to address chronic water shortages throughout the Bay Area dating from the early 1900s. Notably, declining water levels due to over pumping in northern Santa Clara County, including the Stanford/Palo Alto area, were reversed after connecting to the Hetch Hetchy source when other options, such as a cross-valley pipeline, were not undertaken by Santa Clara Valley Water District.

### Hydrographs

**Figures 8** and **9** present groundwater level hydrographs and well locations to interpret and distinguish changes in groundwater conditions in response to the water importation events cited above. The base map shows geologic units of the Santa Clara Plain Groundwater Basin, which consist of an unconfined zone in the western portion of the basin, where natural recharge most readily enters the aquifer system, and a confined unit that occurs in the central portion of the basin. In the western unconfined zone, the base map shows where natural recharge is augmented through instream and artificial (e.g., via ponds and channels) recharge activities by Valley Water. These District activities occur several miles south of the Stanford/Palo Alto area.

**Figure 8** shows that these wells in the Stanford/Palo Alto area (Stanford/Palo Alto shown in red/orange lines; 7D10 and 19G1 shown in blue lines) responded quickly in terms of rising groundwater levels to a significant increase in the use of SFPUC surface water in the area as of 1962. These wells did not show any response to Valley Water importation of surface water from the SWP in 1965 or from Valley Water importation of surface water from the Federal CVP San Felipe Division in 1987. Referring to **Figure 8**, four wells in the Santa Clara/San Jose area (6D01/1H01/2G01/9G11 shown in blue lines) do not show a response to importation/use of SFPUC surface water in 1962, but do show a response to Valley Water's importation of SWP water after 1965. There are also notable differences in responses of the various

wells to the beginning of importation and use of CVP (San Felipe) water in 1987. Wells 6D01 and 1H01 show an elevation increase of about 50 feet for seasonal highs after start of the San Felipe project in 1987. Wells 2G01 and 9G11 show an elevation increase of about 25 feet for seasonal highs after start of the San Felipe project in 1987. The Stanford/Palo Alto wells (red/orange lines) show no response to San Felipe surface water while the Santa Clara/San Jose wells show a significant response to San Felipe water.

Referring to **Figure 8** showing two wells in the Sunnyvale area (29Q02/23Q02), there is a clear difference in response to SFPUC water importation starting in 1962 vs. SWP water importation starting in 1965. The two Sunnyvale area wells show a response only after initiation of SWP water importation, whereas Stanford/Palo Alto wells show an immediate response to SFPUC water importation. Wells 21A01 and 29F02 (located about six miles southeast of Stanford) show a response to San Felipe water importation in the early 1990s after the drought ended. There is a net gain of approximately 25 feet for seasonal highs in wells 21A01 and 29F02 after initiation of the San Felipe project.

Hydrographs for additional CASGEM wells are displayed in **Figure 9**. This set of wells shows similar responses to water importation events to the wells displayed in **Figure 8**. Wells 5F05 and 18J01 (blue lines) and Stanford/Palo Alto wells (red/orange lines) in the northern portion of the subbasin show no response to SCVWD surface water importation events, whereas wells further to the south (e.g., 24C09, 34B06, 26P02, and 35L01 shown in blue lines) do show responses to SCVWD surface water importation events.

Review of these hydrographs clearly show significant differences in groundwater level responses to three different surface water importation projects. Wells in the Stanford/Palo Alto TM Study Area only show responses to the 1962 SFPUC surface water importation event, and not the 1965 or 1987 SCVWD surface water importation event. Alternatively, hydrographs for wells to the south of Stanford/Palo Alto show water level responses to the SCVWD surface water importation events of 1965 and 1987, but these wells show no response to the SFPUC surface water importation event of 1962.

## DISCUSSION

The ZOB study prepared by Montgomery for Valley Water utilizes the overall Santa Clara Plain Subbasin water balance and an evaluation of local groundwater level fluctuations as the primary justification for including Stanford University within the ZOB (Montgomery & Associates, August 2019). LSCE commented previously on our concerns with the lack of technical justification for including Stanford University within the ZOB from SCVWD activities (e.g., Stanford University, May 11, 2018; LSCE, June 28, 2019 and October 7, 2019). Therefore, this current study was undertaken to evaluate the local water balance for the Stanford area (not done in the Valley Water ZOB Study) and to evaluate groundwater level fluctuations in a manner that reflects the impact of the three primary surface water importation projects conducted in the groundwater basin since the 1960s.

The water balance evaluation presented in this TM relies on detailed water balance data specific to the Stanford University/City of Palo Alto TM Study Area from a recent report prepared for Valley Water and

the City of Palo Alto (Woodard & Curran and Todd Groundwater, November 2018). Information from this report was previously cited by Valley Water/Montgomery in response to one of our comment letters on the ZOB study. As described in this TM, the sources and overall amount of groundwater recharge to the Stanford/Palo Alto TM Study Area far exceed the amount of groundwater supply pumping conducted by Stanford and Palo Alto (and others). Groundwater recharge from local sources alone totals 5,250 AFY on an average annual basis, while total groundwater supply pumping within the Stanford/Palo Alto TM Study Area (this includes pumping by Stanford University, City of Palo Alto, and all other water supply pumping sources) amounts to 1,545 AFY (see Water Supply Pumping in **Table 5**). The amount of recharge in the TM Study Area, combined with the use of SFPUC surface water supplies in the TM Study Area, have resulted in a local water balance that supports past and potentially greater groundwater pumping by Stanford University.

The groundwater level fluctuation analysis conducted for the Stanford/Palo Alto area in the Valley Water ZOB study is flawed for the reasons outlined in our previous comment letters. In summary, the analysis in the ZOB study relied on time periods that were either impacted by ongoing residual recovery in groundwater levels from major historical changes (reductions) in local groundwater pumping, or utilizes time periods with insufficient groundwater level data. A different and more useful type of groundwater level fluctuation analysis was conducted for this TM by reviewing patterns of groundwater level fluctuations for a number of wells with long-term records compared to the implementation of the three major surface water importation events in the groundwater basin. Groundwater level fluctuations in a series of wells spanning from Stanford/Palo Alto in the north to San Jose in the south were examined relative to importation of SFPUC surface water in the North County in 1962, importation of State Project water by Valley Water in 1965, and importation of Federal San Felipe water by Valley Water in 1987.

As described in this TM, the North County (i.e., Stanford University and City of Palo Alto) wells already responded to the 1962 SFPUC event while recovery of groundwater levels in wells farther south did not begin until the 1965 Valley Water surface water importation event. In addition, while North County wells showed no response to the 1987 Valley Water importation event, wells farther south showed a distinct response to the 1987 event. Therefore, the groundwater level fluctuation analysis presented in this TM demonstrates that the North County area is not receiving benefits from Valley Water recharge facilities/activities. Furthermore, the issue of low groundwater levels that existed in the Stanford/Palo Alto area prior to 1962 was mitigated and solved solely by additional surface water supplies obtained from SFPUC beginning in 1962.

Stanford and Palo Alto overlie the San Francisquito Creek alluvial fan physiographic unit, also termed the San Francisquito Cone. The alluvial fan is comprised of distinct coarse-grained deposits that have been historically tapped by Stanford University and City of Palo Alto to develop high-yielding water supply wells. Up to the 1960s, groundwater levels declined to nearly 150 feet below sea level in response to greater pumping demand due to population growth in the post-World War II period. Despite groundwater level declines that were similar to those in the south around San Jose, the San Francisquito fan experienced no seawater intrusion nor was there significant measured subsidence, further

demonstrating the distinct hydrogeology in the area. Wells drilled on the southern margins of the San Francisquito Creek alluvial fan, and farther from the present-day San Francisquito Creek alignment, exhibit significantly lower well yields and poor groundwater quality indicating a transition to less favorable aquifer and groundwater conditions. Further south along the peninsula to San Jose, alluvial fans containing permeable coarse-grained deposits are derived from other creeks that are distinct from the San Francisquito unit both in their historical groundwater level fluctuations and the occurrence of seawater intrusion and subsidence. The distinct hydrogeology of the San Francisquito fan and its intervening zone of lower permeability materials to the south is demonstrated through the groundwater level fluctuation analysis described in this TM. In particular, the intervening zone of lower permeability aquifer sediments (located in between major alluvial fans) that occurs between the locations of Valley Water facilities to the south and the Stanford area to the north, along with the distance between them, hydraulically isolates Valley Water activities from the Stanford area.

The information presented in this TM clearly demonstrates that the Stanford/Palo Alto area does not benefit from Valley Water activities and does not need benefits from Valley Water activities because the Stanford/Palo Alto area addressed groundwater replenishment through the use of SFPUC surface water. Furthermore, the use of SFPUC surface water by the North County area is an unrecognized benefit to the groundwater basin. If North County water purveyors had not paid to bring in and serve SFPUC surface water as of 1962, Valley Water would have needed to construct additional facilities to sustain groundwater levels in the North County area. It should be pointed out that no component from recharge activities to the south is required to produce a reasonable water budget for the Stanford/Palo Alto area, nor is there support from the groundwater level fluctuation analysis for Valley Water benefits to the north county area. This is contrary to the conclusions put forth by Montgomery & Associates in their ZOB Study that the Stanford/Palo Alto area receives a benefit from Valley Water activities.

## CONCLUSIONS

The North County area solved its water supply needs and groundwater replenishment concerns in 1962 when it made arrangements with SFPUC to have virtually all of its water supply provided by surface water imported from the Hetch Hetchy reservoir. Furthermore, this TM clearly demonstrates, based on the local North County water balance and local vs. regional groundwater level fluctuations, that the Stanford/Palo Alto area does not benefit from SCVWD activities in any meaningful or discernable way. The north county agencies, which have incorporated the Hetch Hetchy source to mitigate historic water level declines, would benefit through autonomous groundwater management and pumping strategies that provide local resource conservation. This approach is impeded by the financial burden of the District fees for benefits that do not accrue in the North County area.

## REFERENCES

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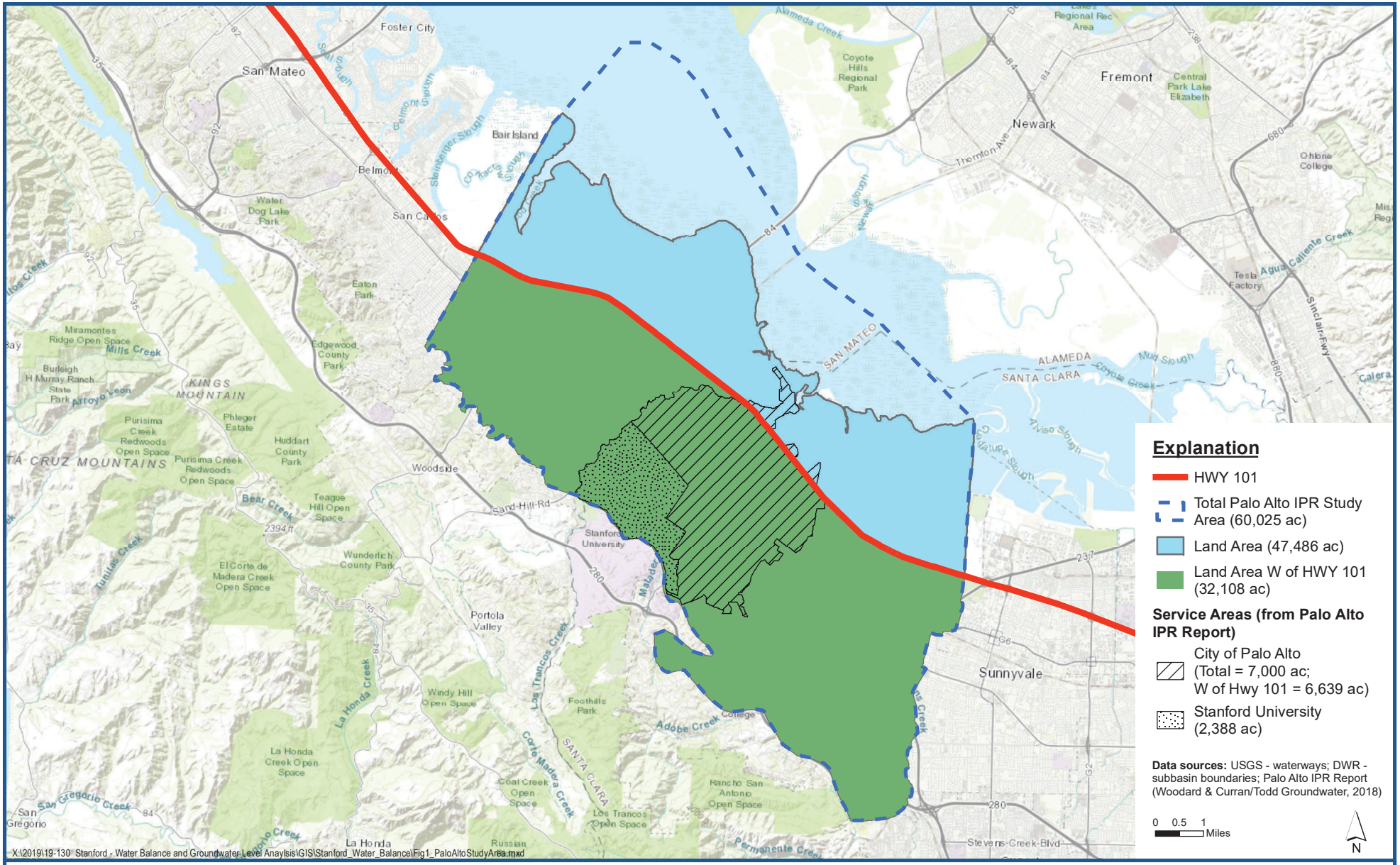
Woodard & Curran and Todd Groundwater, November 2018, *Final, Groundwater Assessment, and Indirect Potable Reuse Feasibility Evaluation and Implementation Strategy, Northwest County recycled Water Strategic Plan*, prepared for City of Palo Alto and Santa Clara Valley Water District.

## List of Tables



## List of Figures

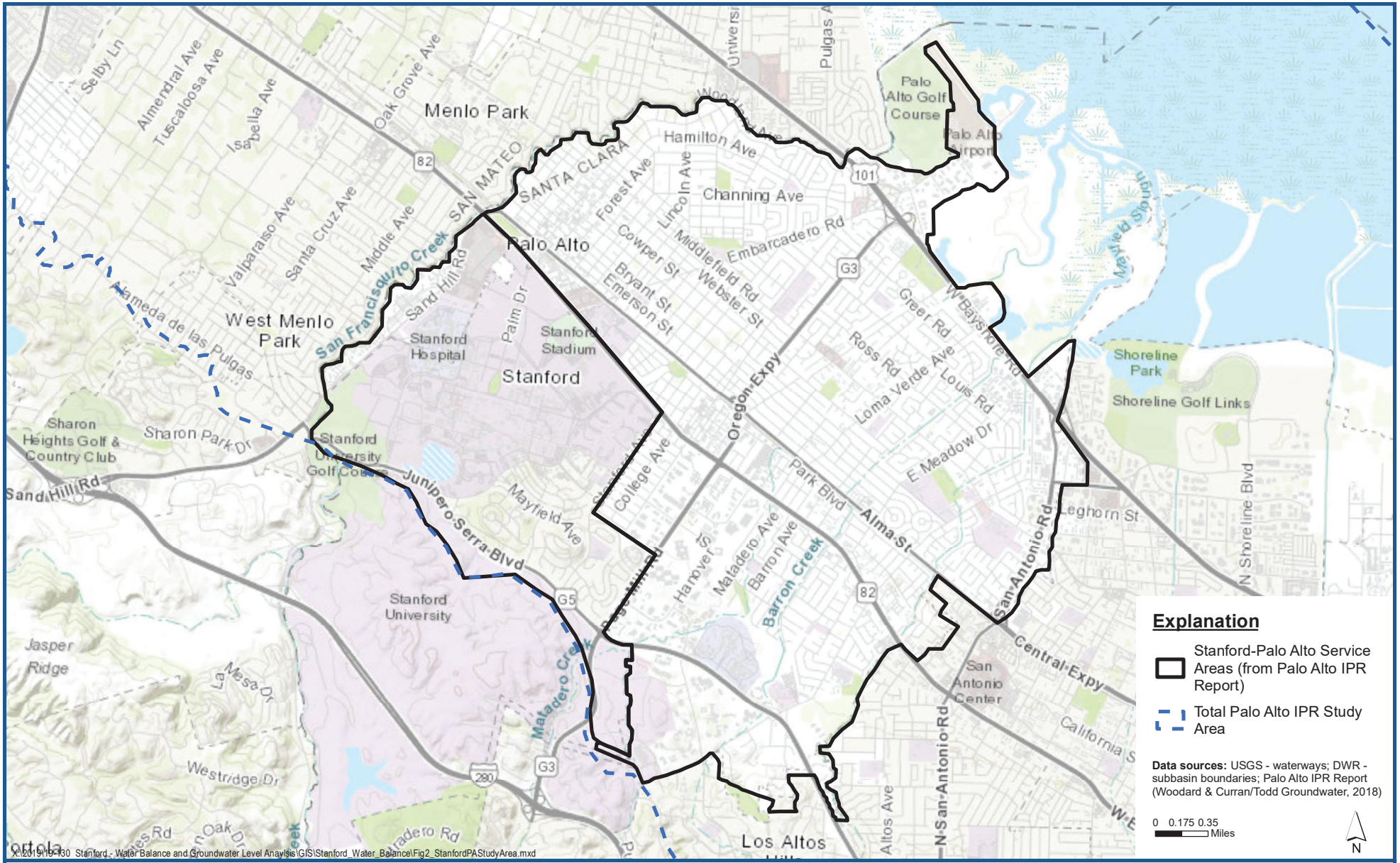



Luhdorff & Scalmanini
Consulting Engineers

**Palo Alto IPR Report Study Area**

*Stanford Water Balance and Groundwater Level Analysis*

**Figure 1**

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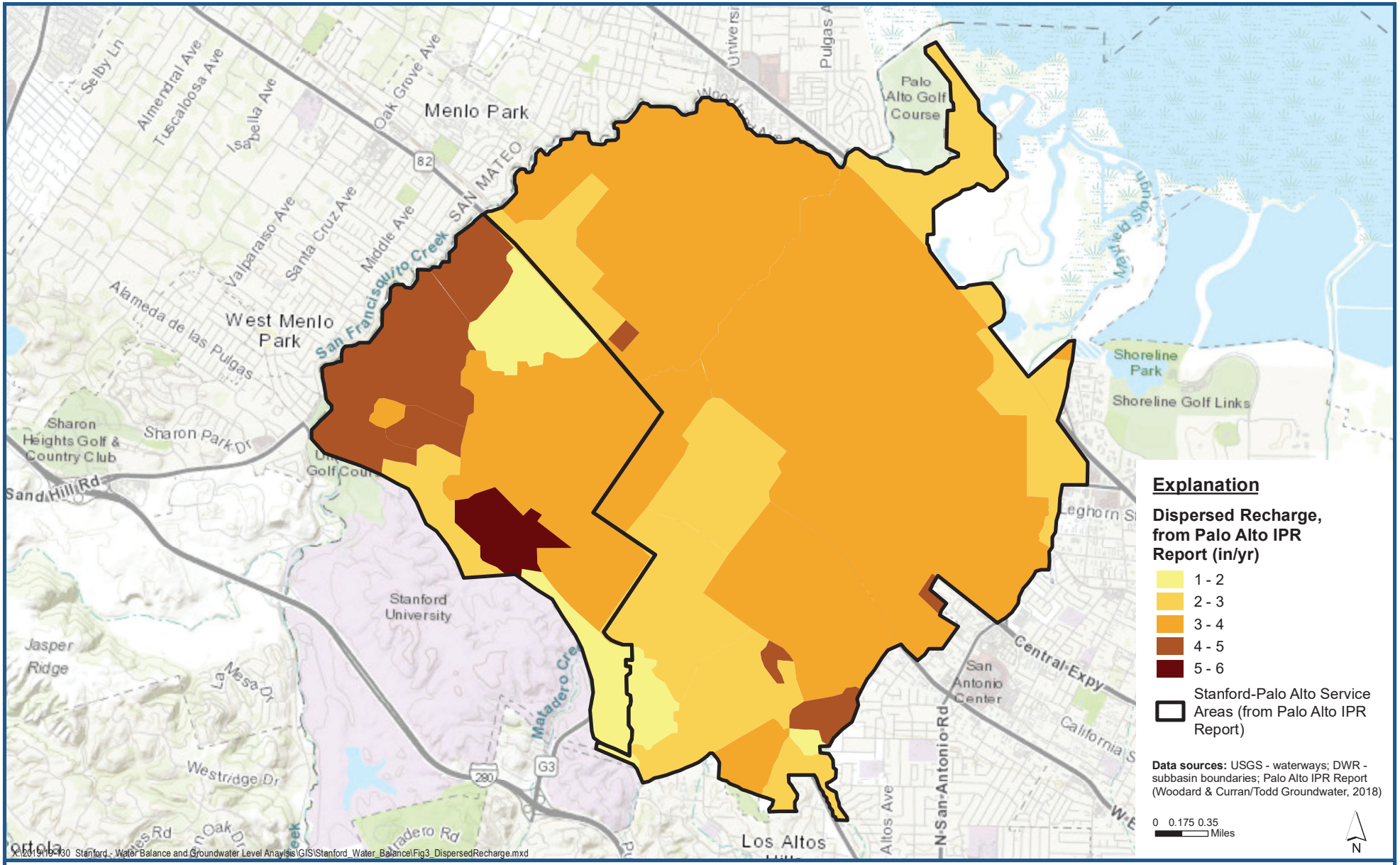
**Stanford & Palo Alto Study Area**

*Stanford Water Balance and Groundwater Level Analysis*

**Figure 2**

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Consulting Engineers

**Dispersed Recharge (in/yr)**

*Stanford Water Balance and Groundwater Level Analysis*

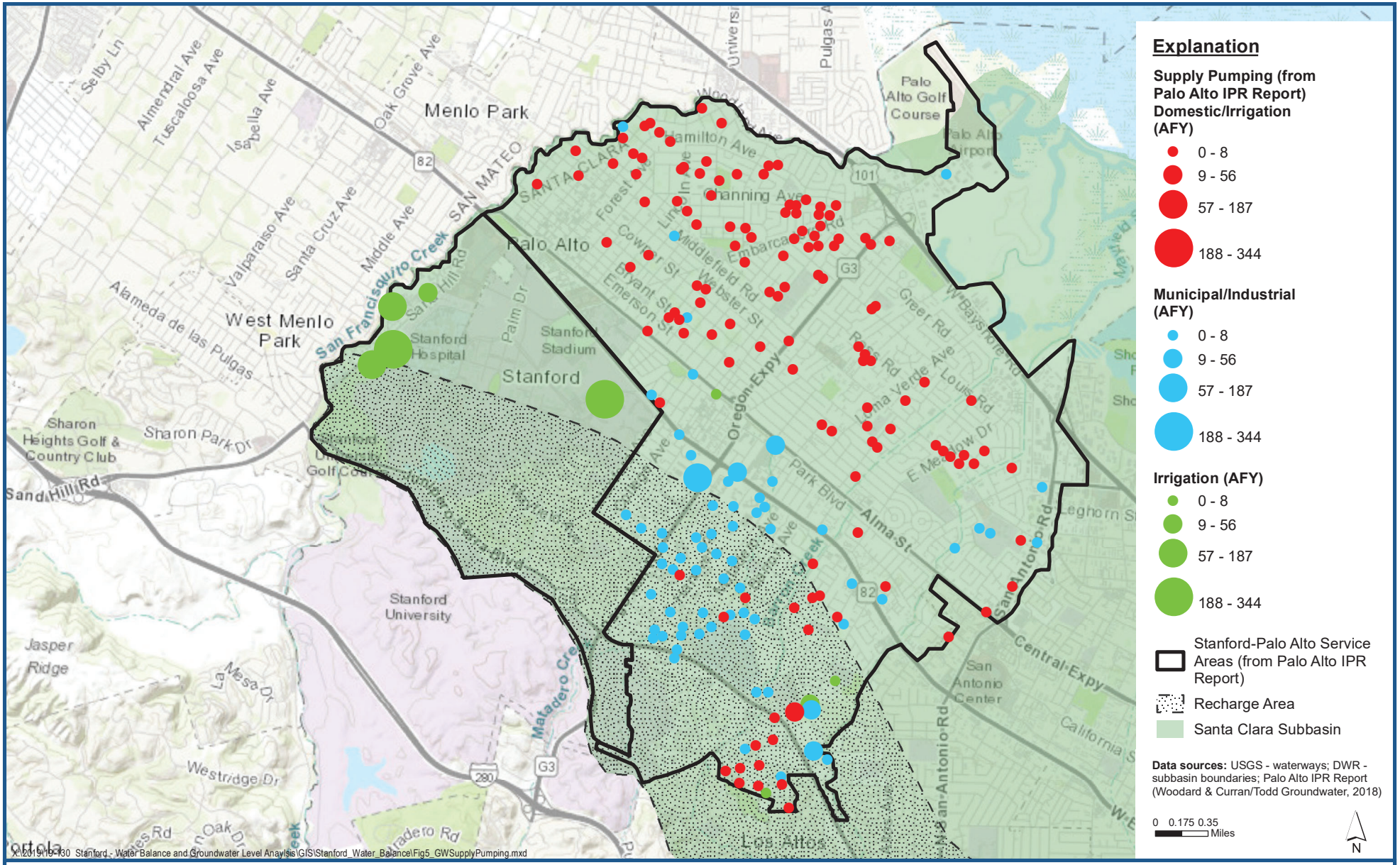
**Figure 3**


Luhdorff & Scalmanini
Consulting Engineers

**Creeks with Stream Infiltration Estimates**

*Stanford Water Balance*
*and Groundwater Level Analysis*

**Figure 4**

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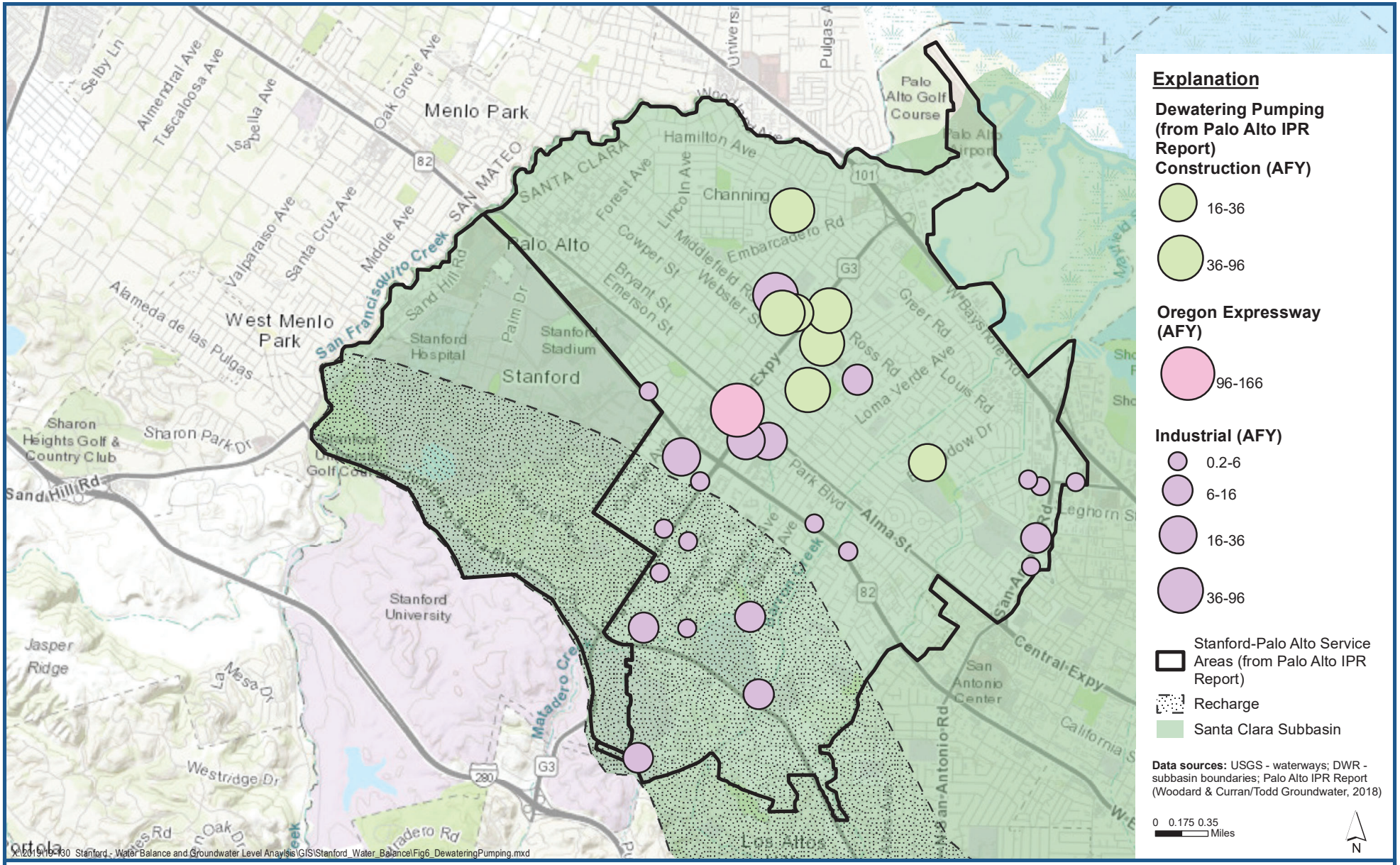
**Water Supply Pumping, 2005-2014**

*Stanford Water Balance and Groundwater Level Analysis*

**Figure 5**

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Consulting Engineers

**Dewatering Pumping, 2016**

*Stanford Water Balance and Groundwater Level Analysis*

**Figure 6**

STANFORD WELL 1
PARK
PEERS
FERNANDO
05F02
05F03
17D10
18J01
19G01
21A01
24C08
24C09
24C10
23Q02
29F02
34B06
29Q02
26P02
35L01
06D01
01H01
02G01
09G11

**Explanation**

- Palo Alto Wells
- CASGEM Wells
- Peninsula Wells
- San Jose Well

**SCVWD- Geologic Units**

- Confined Zone
- Santa Clara County Uplands
- Unconfined Zone

**SCVWD Facilities**

- Stream/Creek
- Instream Recharge
- District Recharge Pond or Facility
- Approx. Extent of Confined Area
- Recharge Area

**Data sources:**
USGS - waterways, DEM; DWR - subbasin boundaries; US Census - cities

0 0.25 0.5 1 Miles

N

X:\2019\19-130 Stanford - Water Balance and Groundwater Level Analysis\GIS\Stanford Water Balance\Stanford Water Balance.aprx:Additional Wells - Peninsula Well Location Map

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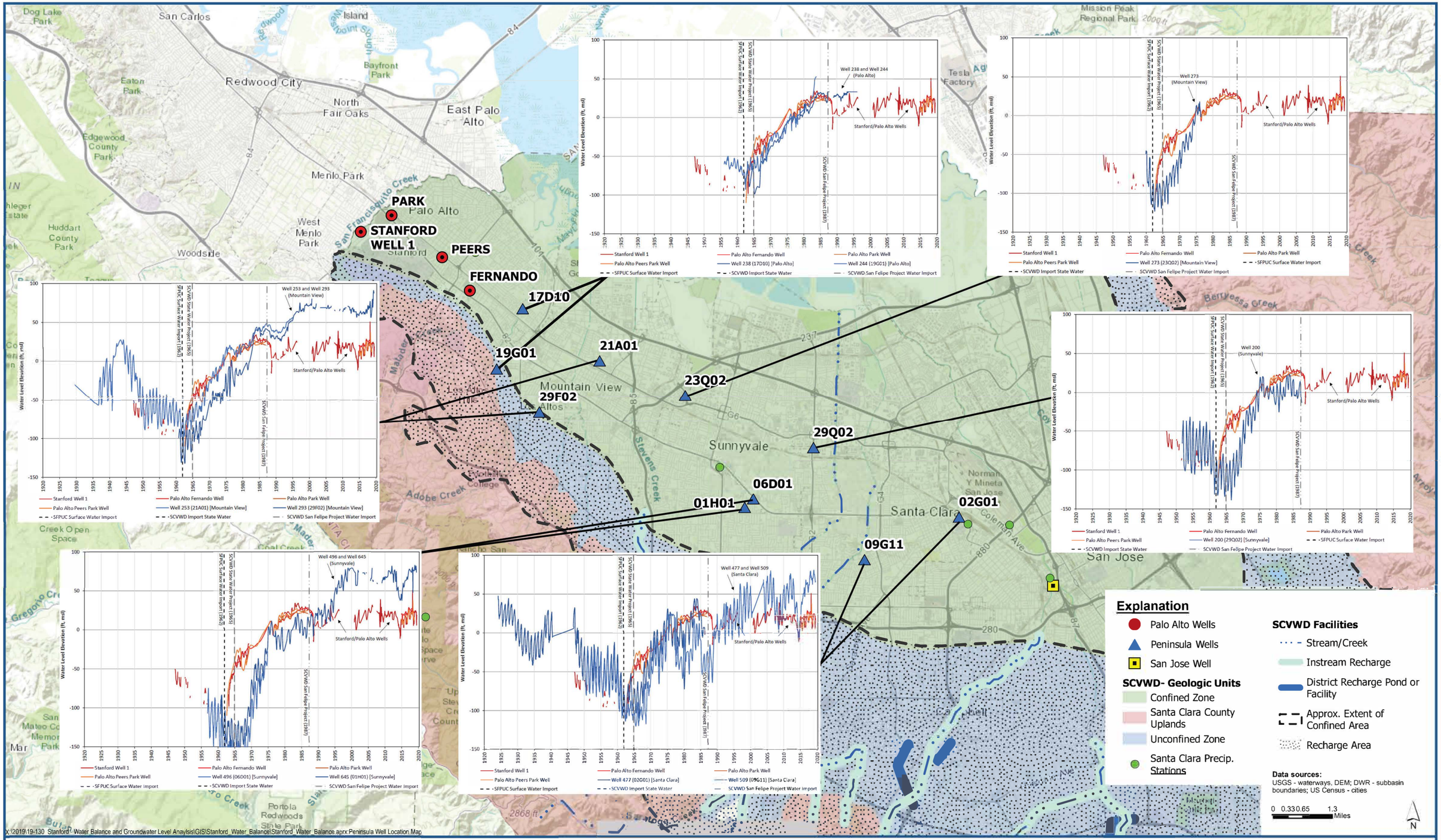
Consulting Engineers

**Peninsula Well Location Map with Hydrographs (Including CASGEM Wells)**

**Figure 7**

*Stanford Water Balance*
*and Groundwater Level Analysis*




X:\2019\19-130 Stanford - Water Balance and Groundwater Level Anaylsis\GIS\Stanford_Water_Balance\Stanford_Water_Balance.aprx:Peninsula Well Location Map

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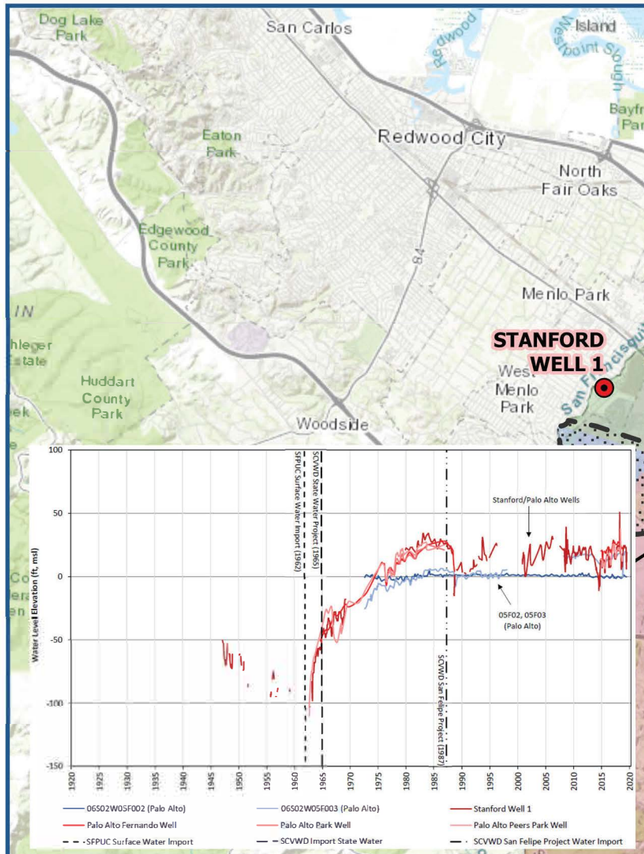
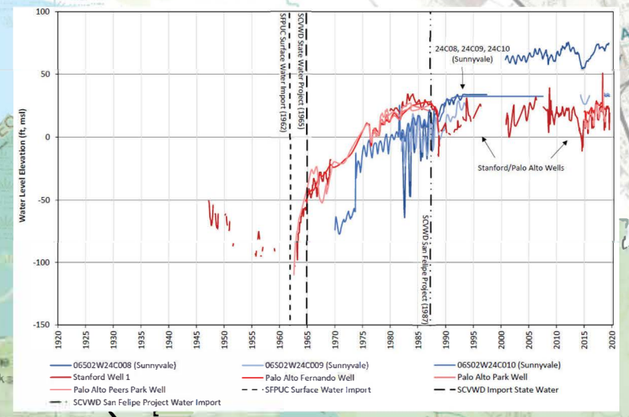
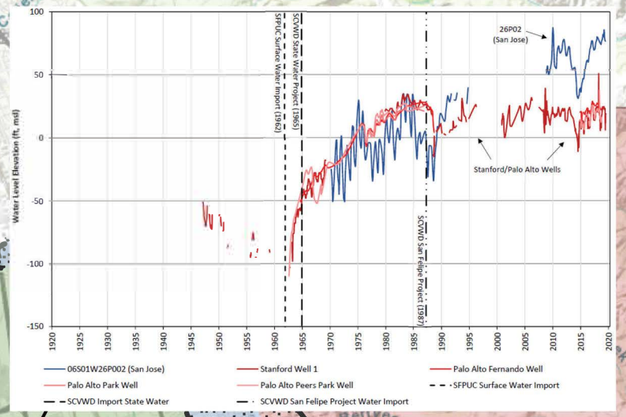
**Peninsula Well Location Map with Hydrographs**

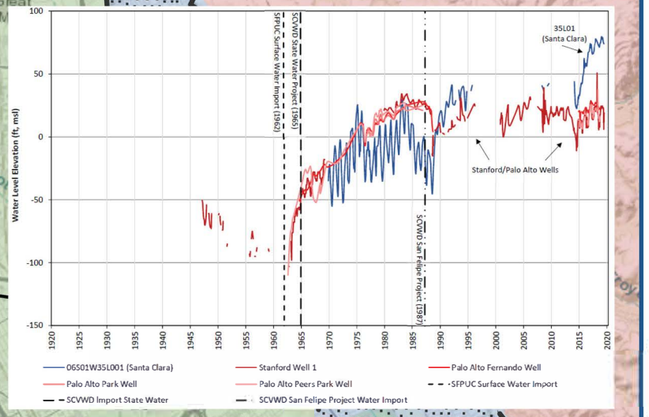
**Figure 8**

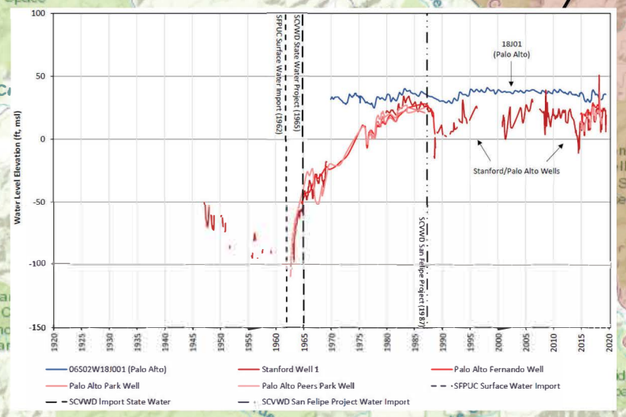
*Stanford Water Balance and Groundwater Level Analysis*

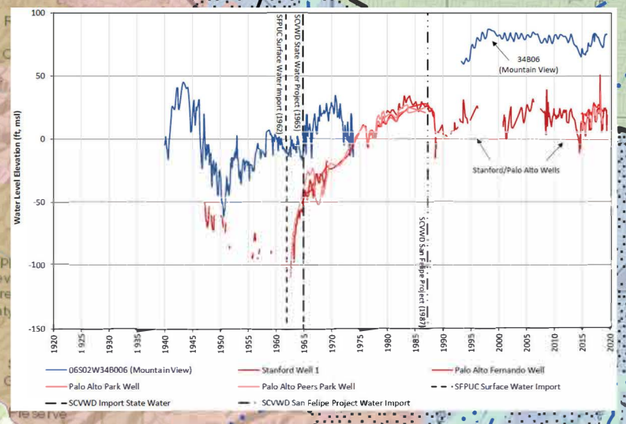





Luhdorff & Scalmanini Consulting Engineers

**CASGEM Well Location Map with Hydrographs**

*Stanford Water Balance and Groundwater Level Analysis*

**Figure 9**

# SCVWD Groundwater Pumping Fees

## Recharge Activities and Benefit in the Stanford University Area

**May 5, 2020**

# Topics of Discussion

1. Stanford claim history and status overview
2. Previous review of Stanford area hydrologic conditions and pumping history
3. Unanswered issues with the SCVWD ZoB Study
4. Recent study of regional groundwater levels history and findings
5. Intended next actions for resolution

# 1. Stanford Claim history and status overview

- Initially filed a claim challenging 2009-2010 groundwater pumping charges in April 2010
- Entered tolling agreement shortly after filing 2010 claim
- Conducted meetings with SCVWD staff 2009 to 2019
- Considering next actions, but hope to continue resolution process

# 2. Previous review of Stanford area SF Cone hydrologic conditions and pumping history

- San Francisquito Creek Cone and Stanford's unique hydrogeologic context
- Lagunita impoundment of hundreds of acres of foothills runoff and creek diversions (local recharge)
- Stanford connected to SFPUC imported water
- Distance from SCVWD recharge facilities and lack of demonstrated recovery therefrom

# 3. Unanswered issues with ZoB Study

- ZoB Study scope excluded consideration of recharge by others or other factors contributing to recharge
- Groundwater model **results and groundwater level fluctuation analysis were inadequate to support inclusion of Stanford in Benefit area**:
  - Concerns about time periods used for groundwater level fluctuation analysis (e.g., ongoing recovery from major local pumping regime changes) were not fully addressed
  - Comments on model structure, inputs, and calibration were not addressed
  - Water balance information in the ZoB Study was basin-wide and not specific to Stanford
- The unsubstantiated claim of hydrogeologic connection was the sole basis of including the Stanford area in the Benefits Zone

# 4. Recent study of regional groundwater levels history and findings

- Local and regional groundwater level fluctuation analysis demonstrates that Stanford/Palo Alto area ONLY benefitted from SFPUC surface water importation event and not SCVWD surface water importation events
- Local water balance supports recent historical and current local groundwater pumping (and potentially greater future local pumping) without need for SCVWD activities

# 5. Intended next actions and proposed resolution

- Meet with SCVWD staff and review findings of most recent analyses in a Technical Memo;
- Discuss process for revising Zones in response to Stanford comments and other means for resolution;
- Stanford to preserve rights to challenge 2011-2019 fees and contest 2020 Zone amendments and groundwater fees.

# Summary of Water Balance and Groundwater Level Fluctuations, Stanford University

Peter Leffler
Principal Hydrogeologist
Luhdorff & Scalmanini, Consulting Engineers

*May 6, 2020*

# Topics of Discussion

- Background
- Local Water Balance
- Local and Regional Groundwater Level Fluctuations
- Conclusions

# 1. Background

- Santa Clara Valley Water District (SCVWD)/Valley Water (VW) published a draft Zone of Benefits (ZOB) Study in October 2017 and a revised draft in April 2019, .
- Stanford University/LSCE reviewed and provided comments in May 2018, June 2019, and October 2019
- Meetings between Stanford reps and VW reps in July 2018 and September 2019
- VW Board of Directors Meeting to adopt revised zones of benefit in October 2019

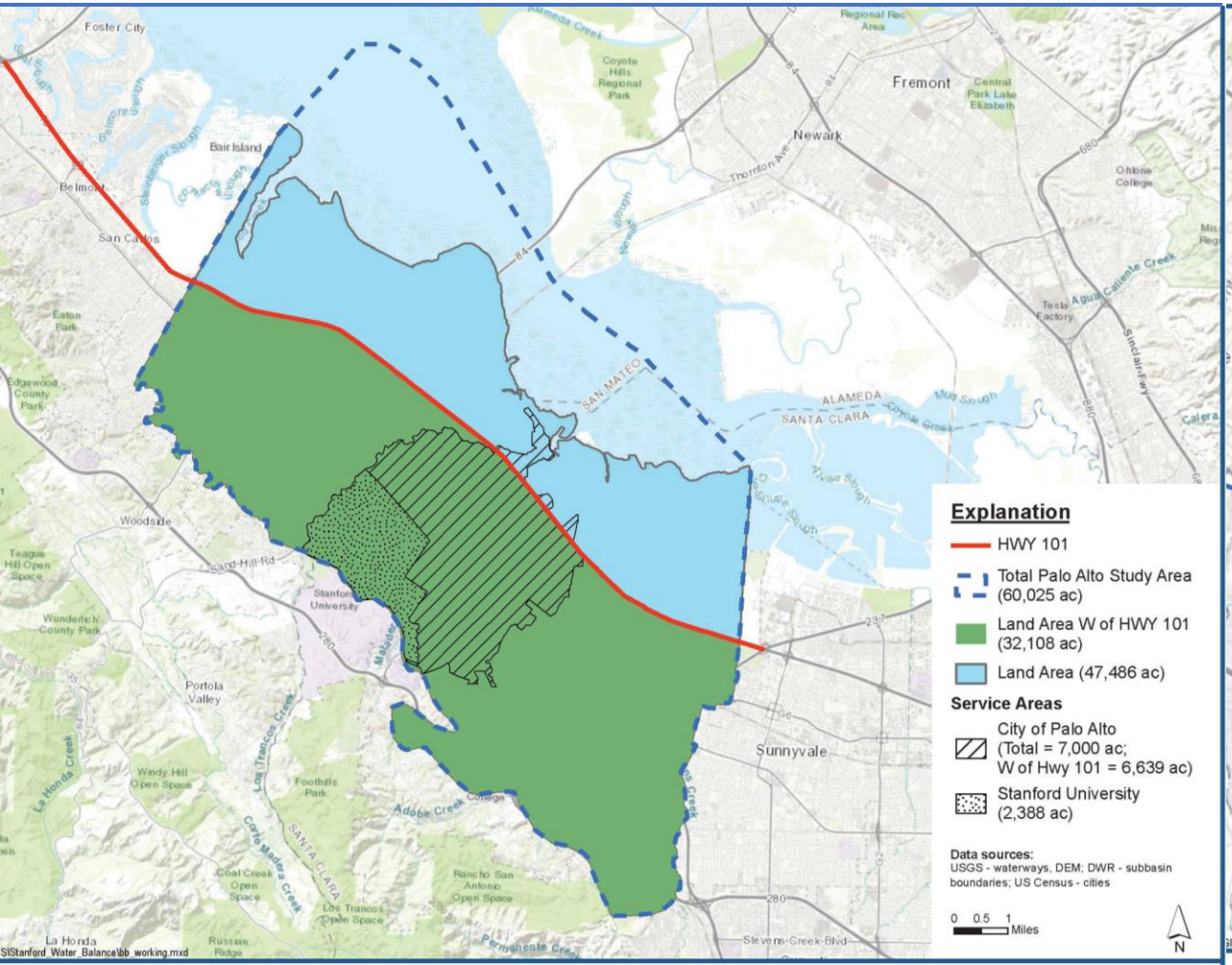
# 2. Water Balance

- VW and City of Palo Alto conducted Indirect Potable Reuse (IPR) Study (November 2018)
- IPR  Study included detailed water balance covering area from southern Redwood City of southern boundary of Mountain View
- IPR water balance quantified individual components of recharge and discharge
- Current TM Study Area includes middle portion of IPR water balance study area and includes service areas of Stanford University and City of Palo Alto
- Current TM Water Balance evaluated each recharge and discharge component within the TM Study Area

# 2. Water Balance (continued)

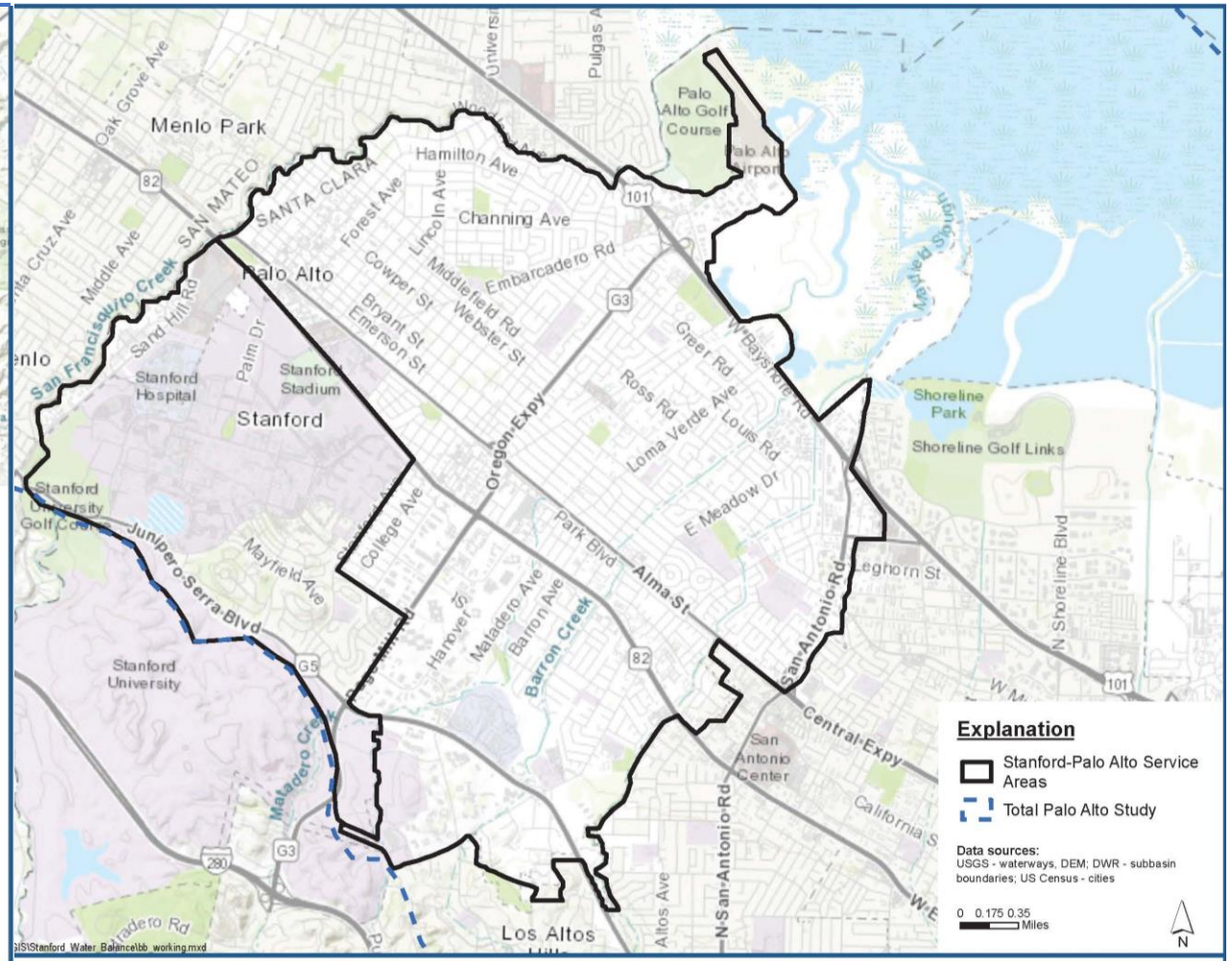
- Primary recharge components:
  - Dispersed Recharge (infiltration from rainfall and irrigation)
  - Stream Infiltration
  - Bedrock Inflow
  - Pipe leakage
  - Lake Lagunita
- Primary Discharge Components:
  - Groundwater Pumping (water supply, dewatering, remediation)
  - Riparian/Wetland ET
  - Seepage to Sanitary Sewers
  - Seepage to Creeks/Storm Drains
  - Outflow to San Francisco Bay

# 2. IPR and Local Water Balance Study Areas




**Palo Alto Study Area** — **Figure 1**

*Stanford Water Balance and Groundwater Level Analysis*




**Stanford & Palo Alto Study Area** — **Figure 2**

*Stanford Water Balance and Groundwater Level Analysis*

# 2. Water Balance – Recharge Components

| Inflows | Average Annual | Proportion of IPR Amount | Comments |
|---|---|---|---|
| **Precipitation and Irrigation Recharge** | 2,600 | 27% | Based on soil moisture balance model used in Palo Alto IPR Study. Includes dispersed recharge for Stanford/Palo Alto service areas from Figure 3-40 of IPR Report. |
| **Stream Recharge** | 1,400 | 33% | Includes 50% of stream infiltration from San Francisquito and Adobe Creeks, and 100% of stream infiltration from Matadero and Barron Creeks from Table 3-11 of IPR Report. |
| **Water Pipe Leaks** | 650 | 36% | Based on water pipe leak calculations for Stanford and Palo Alto in Table 3-7 of IPR Report. |
| **Sewer Pipe Leaks** | 150 | 37.5% | Based on sewer pipe leak calculations for Stanford and Palo Alto in Table 3-8 or IPR Report. |
| **Lake Lagunita Recharge** | 200 | 50% | Based on estimated recharge in Table 3-5 of IPR Report; corrected using Stanford data. |
| **Bedrock Inflow** | 250 | 28% | Based on the amount estimate in Table 3-5 of IPR Report (900 AFY) prorated to the distance along the western boundary of the Stanford/Palo Alto study area. |
| **Recharge Total** | 5,250 | 30% | |

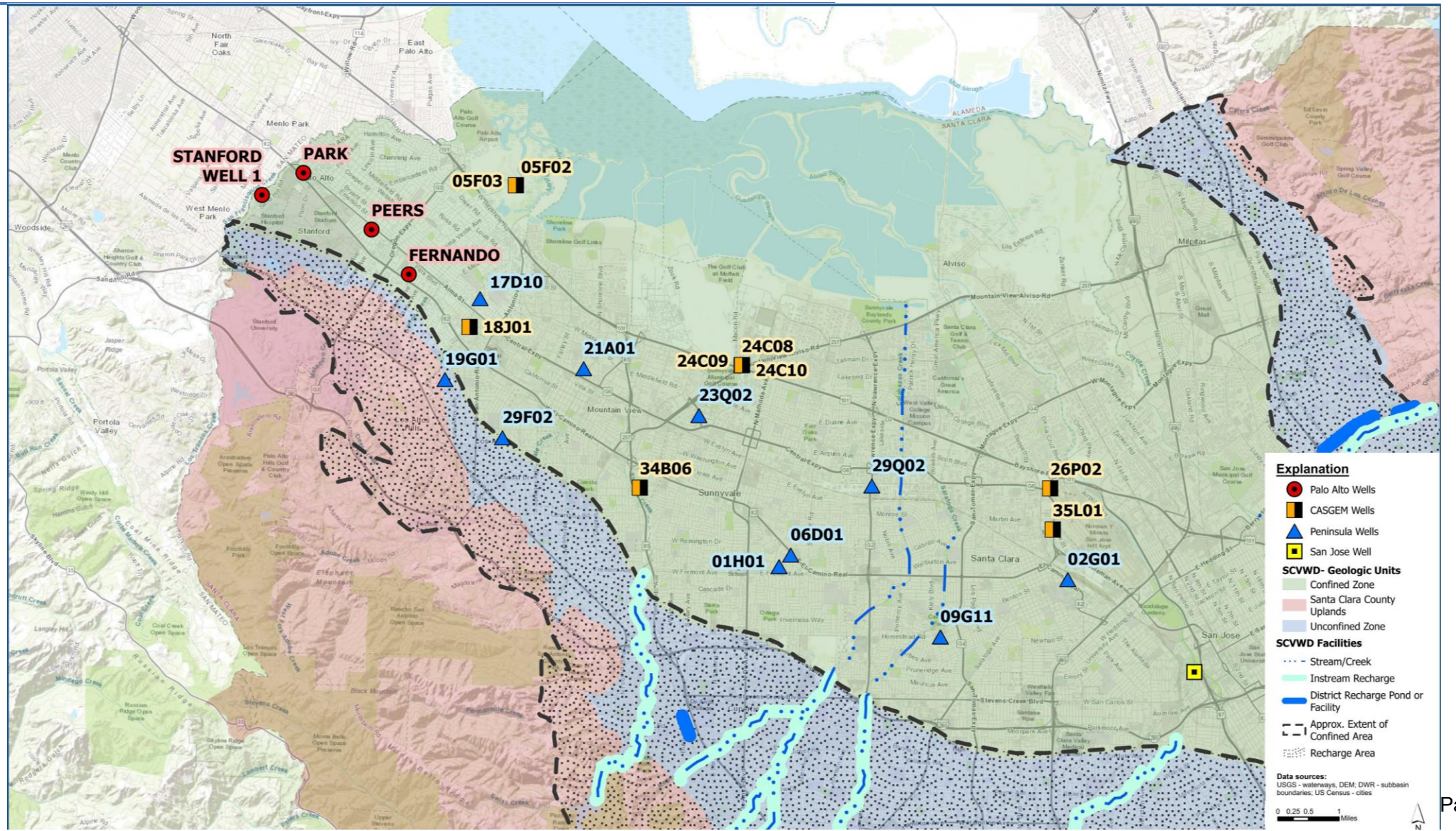
# 2. Water Balance – Discharge Components

| Inflows | Average Annual | Proportion of IPR Amount | Comments |
|---|---|---|---|
| **Water Supply Well Pumping** | 1,550 | 28% | Based upon estimated domestic/irrigation and municipal/industrial pumping within Stanford/Palo Alto TM Study Area shown on Figure 3-42 of IPR Report. Stanford Irrigation pumping based on actual 2005-2014 records. |
| **Remediation Well Pumping** | 500 | 45% | Assumed to be approximately 50% of total remediation pumping in Santa Clara Plain. |
| **Dewatering Well Pumping** | 800 | 50% | Based on data collected for 2016 in Palo Alto, as shown on Figure 3-43 of IPR Report. |
| **Riparian/Wetland ET** | 250 | 50% | Includes 50% of riparian ET from San Francisquito and Adobe Creeks, and 100% of riparian ET from Matadero and Barron Creeks from Table 3-13 of IPR Report. |
| **Seepage to Sanitary Sewers** | 1,450 | 73% | Includes Palo Alto portion from Figure 3-44 of IPR Report. |
| **Seepage to Creeks/Storm Drains** | 450 | 10% | Two-thirds of water balance residual per IPR Report. |
| **Outflow to SF Bay** | 250 | 11% | One-third of water balance residual per IPR Report. |
| **Discharge Totals** | 5,250 | 30% | |

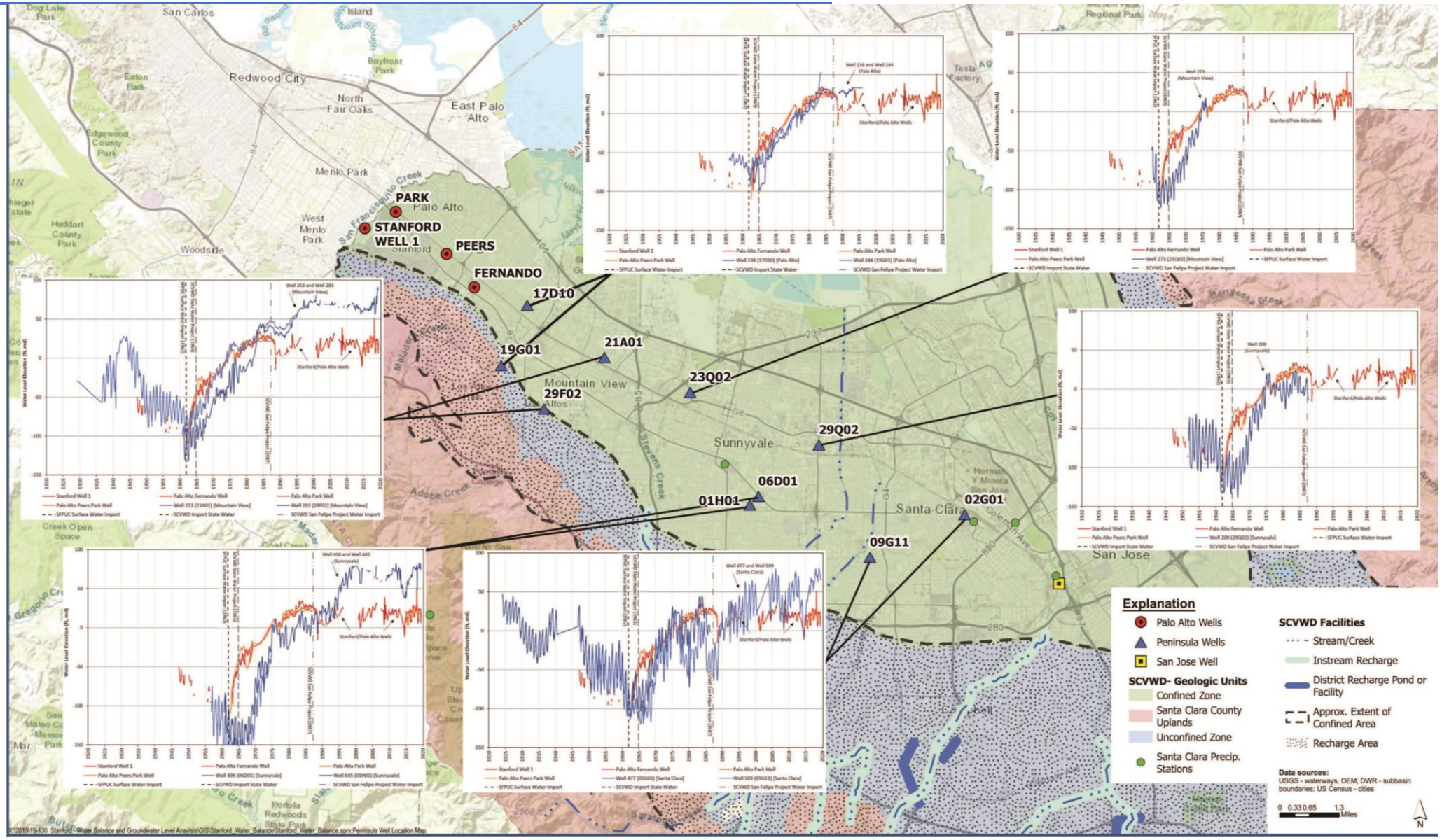
# 2. Discharge Components – Groundwater Pumping

| Individual Well Pumping Amount (AFY) | Domestic / Irrigation Pumping (AFY) | Municipal / Industrial Pumping (AFY) | Palo Alto Irrigation Pumping (AFY) | Stanford Irrigation Pumping[1] (AFY) | Total Pumping (AFY) |
|---|---|---|---|---|---|
| **0-8** | 515 | 250 | 15 | NA | NA |
| **9-56** | 35 | 130 | 35 | NA | NA |
| **57-187** | 0 | 120 | 0 | NA | NA |
| **Total** | 550 | 500 | 50 | 450 | 1,550 |

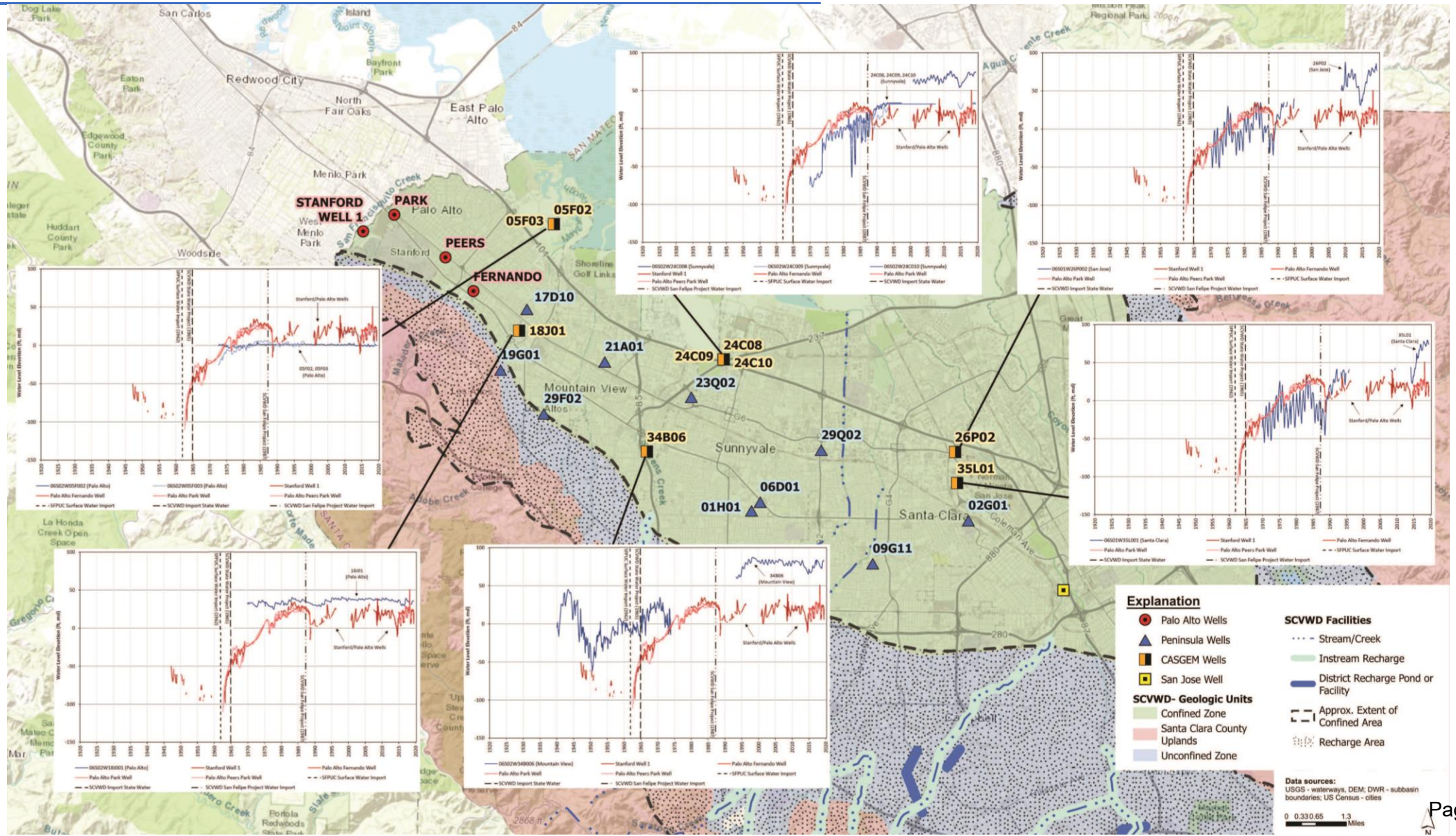
# 3. Groundwater Level Fluctuations



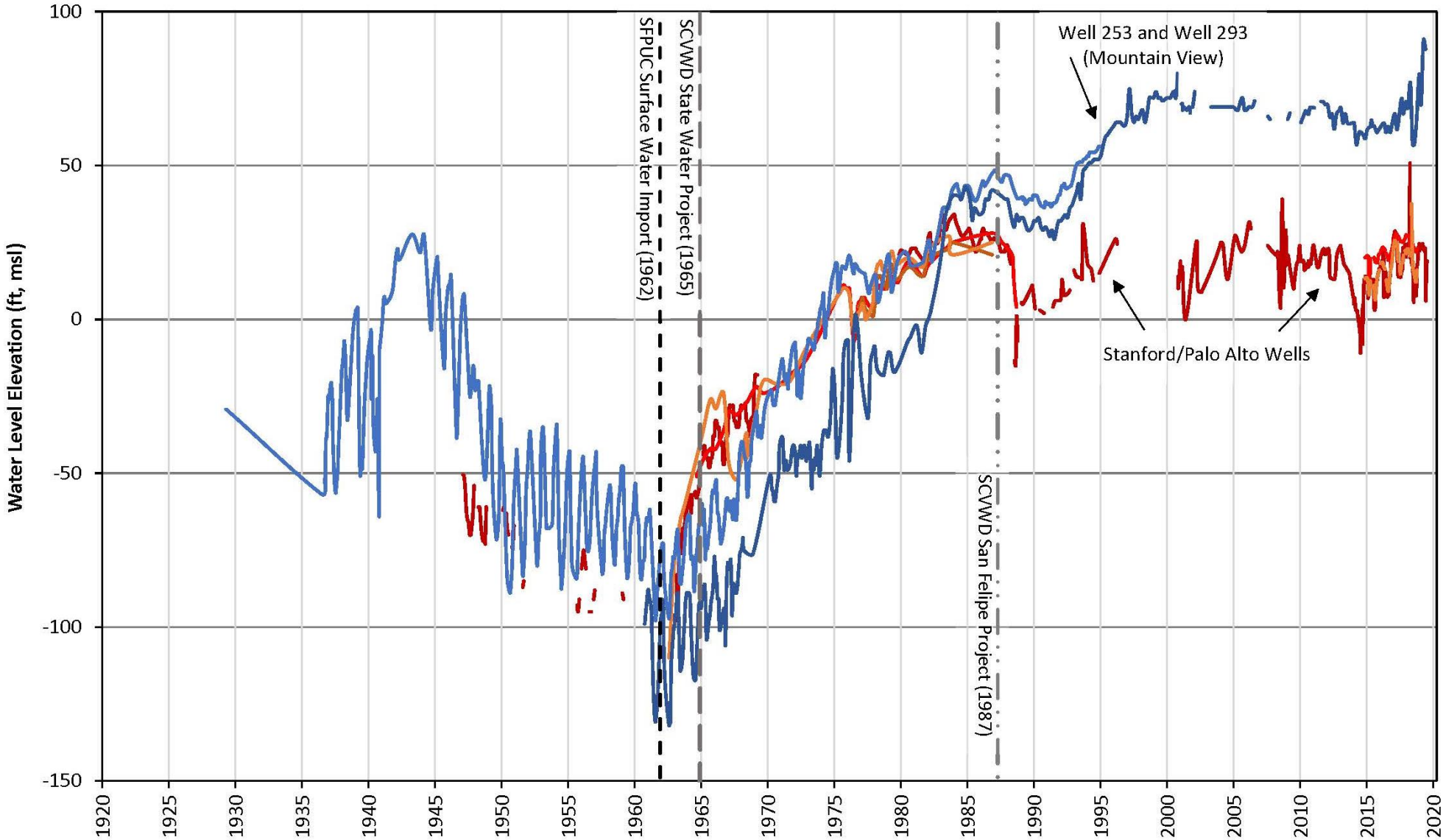
# 3. Groundwater Level Fluctuations



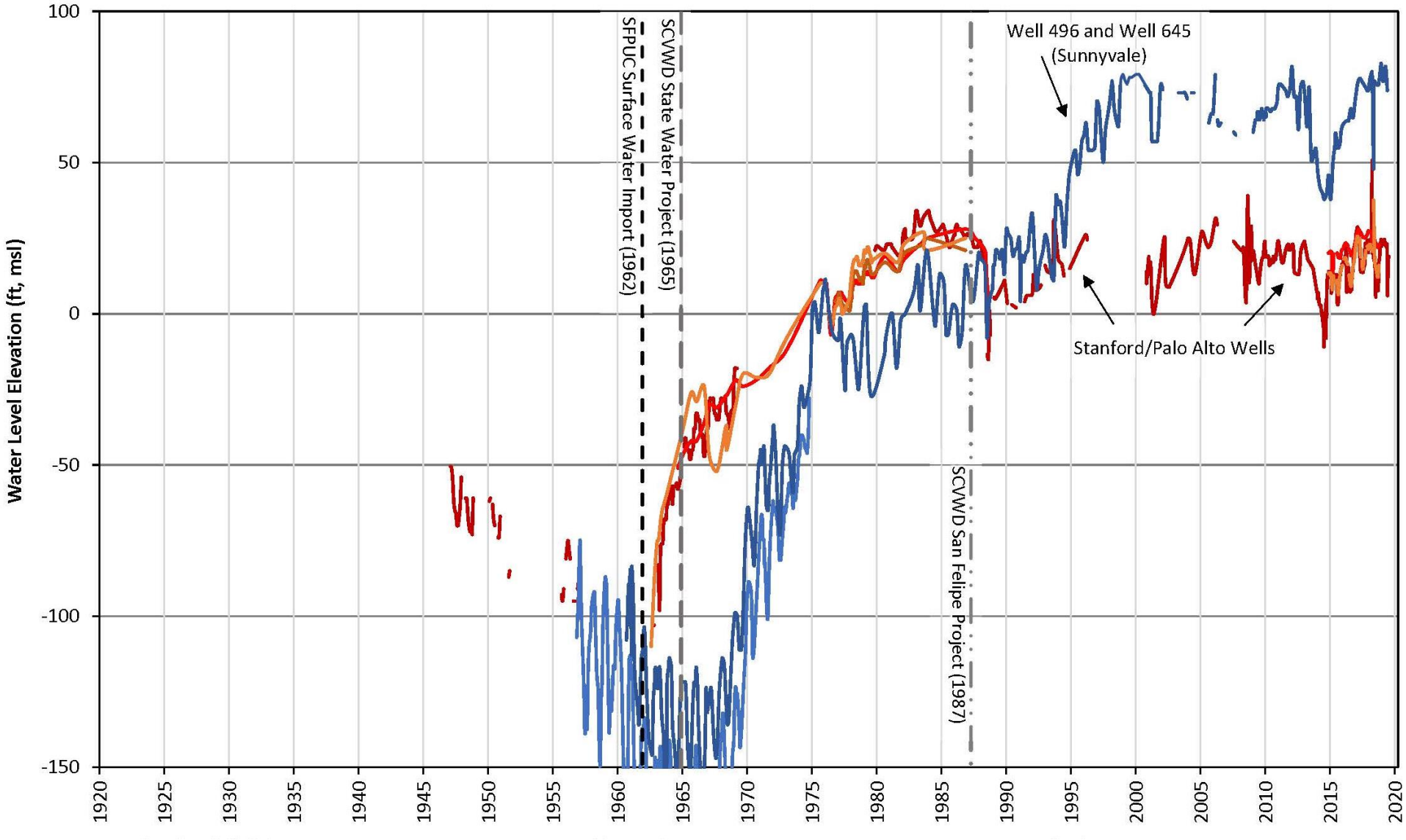
# 3. Groundwater Level Fluctuations



# Stanford Wells Respond Only to SFPUC Water Imports



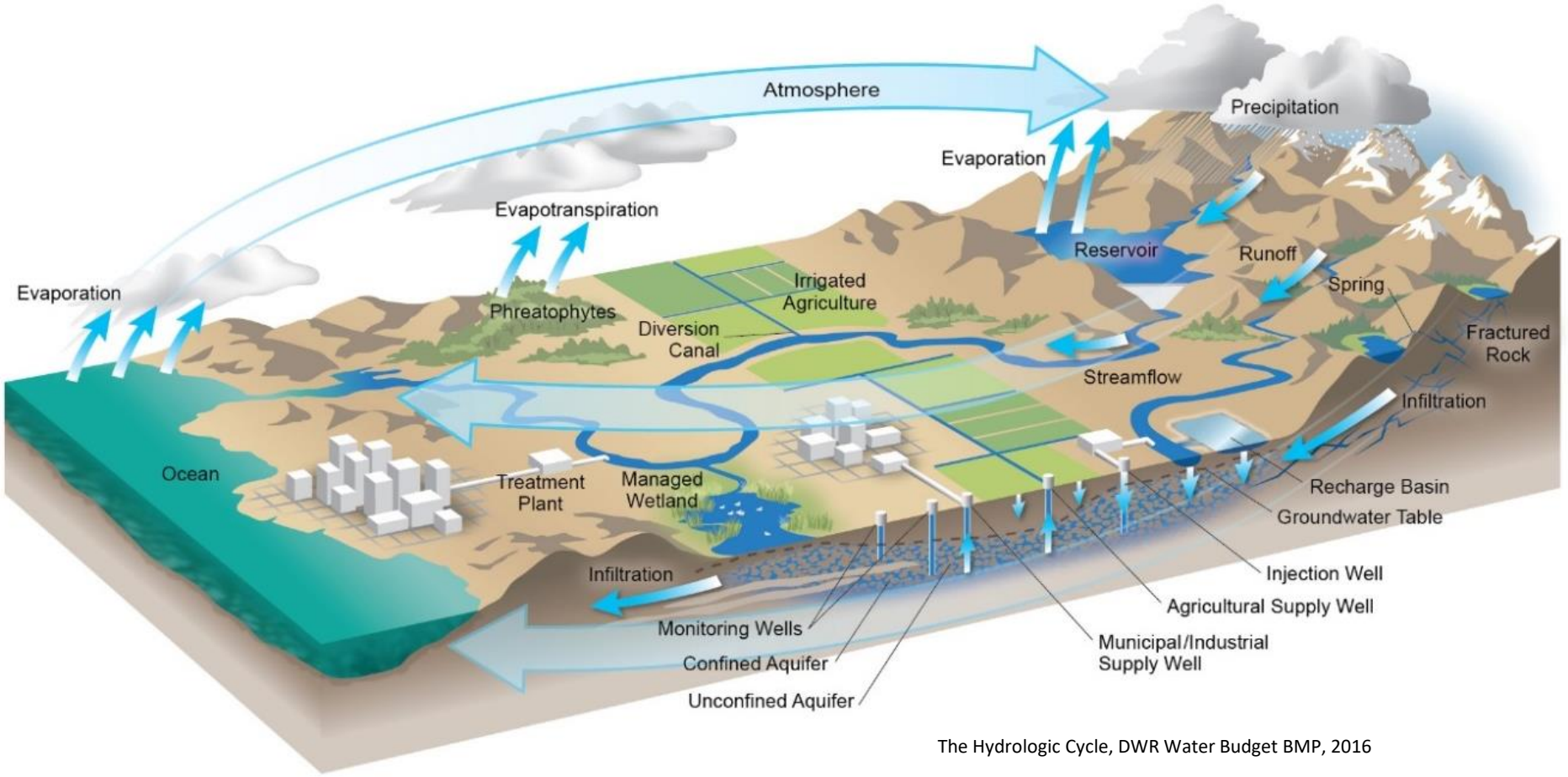
# Stanford Wells Respond Only to SFPUC Water Imports



# 4. Conclusions

- Groundwater pumping in Stanford/Palo Alto area is only about 30% of total local recharge
- Local recharge sources more than adequate to maintain local historical/current pumping with potential capacity for future increases in pumping
- Groundwater level fluctuation analysis demonstrates Stanford/Palo Alto wells responded only to SFPUC surface water importation event and not Valley Water surface water importation events
- There are no demonstrated benefits to Stanford University from Valley Water facilities/activities

# Any Questions?




The Hydrologic Cycle, DWR Water Budget BMP, 2016

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