

APPENDIX A

Statement of Findings Regarding the Approval of the Santa Ynez River Valley Basin Groundwater Sustainability Plan



CALIFORNIA DEPARTMENT OF WATER RESOURCES

SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

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January 18, 2024

Bill Buelow
Santa Ynez River Valley Basin Western Management Area GSA
PO Box 719
Santa Ynez, CA 93460
bbuelow@syrwcd.com

RE: Santa Ynez River Valley Basin - 2022 Groundwater Sustainability Plans

Dear Bill Buelow,

The Department of Water Resources (Department) has evaluated the three groundwater sustainability plans (GSPs) submitted for the Santa Ynez River Valley Basin (Basin), as well as the materials considered to be part of the required coordination agreement. Collectively, the three GSPs and the coordination agreement are referred to as the Plan for the Basin. The Department has determined the Plan is approved. The approval is based on recommendations from the Staff Report, included as an exhibit to the attached Statement of Findings, which describes that the Basin GSPs satisfy the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially comply with the GSP Regulations. The Staff Report also proposes recommended corrective actions that the Department believes will enhance the Plan and facilitate future evaluation by the Department. The Department strongly encourages the recommended corrective actions be given due consideration and suggests incorporating all resulting changes to the GSPs in future updates.

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their GSPs at least every five years and whenever the Plan is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved GSPs and issue an assessment at least every five years. The Department will initiate the first periodic review of the Basin GSP no later than January 20, 2027.

Please contact Sustainable Groundwater Management staff by emailing sgmps@water.ca.gov if you have any questions related to the Department's assessment or implementation of your GSP.

Thank You,

Paul Gosselin
Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Approval of the Santa Ynez River Valley Basin Groundwater Sustainability Plan

**STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES**

**STATEMENT OF FINDINGS REGARDING THE
APPROVAL OF THE
SANTA YNEZ RIVER VALLEY BASIN GROUNDWATER SUSTAINABILITY PLAN**

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP or Plan) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA or Act), is likely to achieve the sustainability goal for the Basin covered by the Plan, and whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the Plan within two years of its submission. (Water Code § 10733.4.) This Statement of Findings explains the Department's decision regarding the three GSPs (collectively referred to as "the Plan") submitted by the Western Management Area, Central Management Area, and Eastern Management Area Groundwater Sustainability Agencies (GSAs or Agencies) for the Santa Ynez River Valley Basin (No. 3-015).

Department management has discussed the Plan with staff and has reviewed the Department Staff Report, entitled Sustainable Groundwater Management Program Groundwater Sustainability Plan Assessment Staff Report, attached as Exhibit A, recommending approval of the Plan. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Plan and concurs with staff's recommendation and all the recommended corrective actions. The Department therefore **APPROVES** the Plan and makes the following findings:

- A. The Plan satisfies the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.):
 - 1. The Plan was submitted within the statutory deadline of January 31, 2022. (Water Code § 10720.7(a); 23 CCR § 355.4(a)(1).)
 - 2. The Plan was complete, meaning it generally appeared to include the information required by the Act and the GSP Regulations sufficient to warrant a thorough evaluation and issuance of an assessment by the Department. (23 CCR § 355.4(a)(2).)
 - 3. The Plan, either on its own or in coordination with other Plans, covers the entire Basin. (23 CCR § 355.4(a)(3).)
- B. The general standards the Department applied in its evaluation and assessment of the Plan are: (1) "conformance" with the specified statutory requirements, (2) "substantial compliance" with the GSP Regulations, (3) whether the Plan is likely

to achieve the sustainability goal for the Basin within 20 years of the implementation of the Plan, and (4) whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) Application of these standards requires exercise of the Department's expertise, judgment, and discretion when making its determination of whether a Plan should be deemed "approved," "incomplete," or "inadequate."

The statutes and GSP Regulations require Plans to include and address a multitude and wide range of informational and technical components. The Department has observed a diverse array of approaches to addressing these technical and informational components being used by GSAs in different basins throughout the state. The Department does not apply a set formula or criterion that would require a particular outcome based on how a Plan addresses any one of SGMA's numerous informational and technical components. The Department finds that affording flexibility and discretion to local GSAs is consistent with the standards identified above; the state policy that sustainable groundwater management is best achieved locally through the development, implementation, and updating of local plans and programs (Water Code § 113); and the Legislature's express intent under SGMA that groundwater basins be managed through the actions of local governmental agencies to the greatest extent feasible, while minimizing state intervention to only when necessary to ensure that local agencies manage groundwater in a sustainable manner. (Water Code § 10720.1(h).) The Department's final determination is made based on the entirety of the Plan's contents on a case-by-case basis, considering and weighing factors relevant to the particular Plan and Basin under review.

- C. In making these findings and Plan determination, the Department also recognized that: (1) the Department maintains continuing oversight and jurisdiction to ensure the Plan is adequately implemented; (2) the Legislature intended SGMA to be implemented over many years; (3) SGMA provides Plans 20 years of implementation to achieve the sustainability goal in a Basin (with the possibility that the Department may grant GSAs an additional five years upon request if the GSA has made satisfactory progress toward sustainability); and, (4) local agencies acting as GSAs are authorized, but not required, to address undesirable results that occurred prior to enactment of SGMA. (Water Code §§ 10721(r); 10727.2(b); 10733(a); 10733.8.)
- D. The Plan conforms with Water Code §§ 10727.2 and 10727.4, substantially complies with 23 CCR § 355.4, and appears likely to achieve the sustainability goal for the Basin. It does not appear at this time that the Plan will adversely affect the ability of adjacent basins to implement their GSPs or impede achievement of sustainability goals.

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January 18, 2024

1. The sustainable management criteria that have been established for chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and interconnected surface water are reasonable. While Department staff have identified multiple recommended corrective actions to improve the sustainable management criteria, they do not believe that these issues should preclude Plan approval. The GSPs rely on credible information and science, such as historical groundwater elevation data, well impacts analyses, historical groundwater quality data, and groundwater quality regulatory thresholds to quantify the groundwater conditions that the Plan seeks to avoid and to provide an objective way to determine whether the Basin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)
2. The Plan identifies data gaps related to monitoring networks, the hydrogeologic conceptual model, interconnected surface water, and understanding pumping from the Santa Ynez River Alluvium. The Plan contains potential projects and management actions associated with filling data gaps, including but not limited to installing monitoring wells, refining the hydrogeological conceptual model, and improving the understanding of groundwater conditions. (23 CCR § 355.4(b)(2).)
3. The projects and management actions proposed in the Plan are designed to eliminate long-term overdraft conditions in the Basin through target demand reduction, increased groundwater or surface water supply, filling data gaps, improving groundwater quality, and possibly implementing a credit or trading program. The projects and management actions appear reasonable and commensurate with the level of understanding of the Basin setting. The projects and management actions described in the Plan provide a feasible approach to achieving the Basin's sustainability goal and should provide the GSAs with greater versatility to adapt and respond to changing conditions and future challenges during GSP implementation. (23 CCR § 355.4(b)(3).)
4. The Plan provides a detailed explanation of how the varied interests of groundwater uses and users in the Basin were considered in developing the sustainable management criteria and conducts well analyses to show how those interests, such as domestic, municipal, and agricultural well users, would be impacted by the chosen minimum thresholds. (23 CCR § 355.4(b)(4).)
5. The Plan's projects and management actions appear feasible at this time and capable of preventing undesirable results and ensuring that the Basin is operated within its sustainable yield within 20 years. The Department

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- will continue to monitor Plan implementation and reserves the right to change its determination if projects and management actions are not implemented or appear unlikely to prevent undesirable results or achieve sustainability within SGMA timeframes. (23 CCR § 355.4(b)(5).)
6. The Plan includes a reasonable assessment of overdraft conditions and includes reasonable means to mitigate overdraft, if present. (23 CCR § 355.4(b)(6).)
 7. At this time, it does not appear that the Plan will adversely affect the ability of an adjacent basin to implement its GSP or impede achievement of sustainability goals in an adjacent basin (23 CCR § 355.4(b)(7).)
 8. A satisfactory coordination agreement has been adopted by all relevant parties. (23 CCR § 355.4(b)(8).)
 9. The member agencies of the GSAs include the City of Lompoc, Vandenberg Village Community Services District, Mission Hills Community Services District, Santa Ynez River Water Conservation District, and Santa Barbara County Water Agency in the Western Management Area GSA; the Santa Ynez River Water Conservation District, Santa Barbara County Water Agency, and City of Buellton in the Central Management Area GSA; and the Santa Ynez River Water Conservation District; Santa Barbara County Water Agency; City of Solvang; and Santa Ynez River Water Conservation District, Improvement District No. 1 in the Eastern Management Area GSA. The member agencies have historically developed and implemented water management plans, water management programs, and water resource monitoring within their respective management areas. The GSAs' member agencies and their history of groundwater management provide a reasonable level of confidence that the GSAs have the legal authority and financial resources necessary to implement the Plan. (23 CCR § 355.4(b)(9).)
 10. Through review of the Plan and consideration of public comments, the Department determines that the GSAs adequately responded to comments that raised credible technical or policy issues with the Plan, sufficient to warrant approval of the Plan at this time. The Department also notes that the recommended corrective actions included in the Staff Report are important to addressing certain technical or policy issues that were raised and, if not addressed before future, subsequent plan evaluations, may preclude approval of the Plan in those future evaluations. (23 CCR § 355.4(b)(10).)

E. In addition to the grounds listed above, DWR also finds that:

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1. The Department developed its GSP Regulations consistent with and intending to further the State's human right to water policy through implementation of SGMA and the Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water in its evaluation of the Plan. (Water Code § 106.3; 23 CCR § 350.4(g).)
2. The Plan acknowledges and identifies interconnected surface waters within the Basin. The GSAs propose initial sustainable management criteria to manage this sustainability indicator and provide measures to improve understanding and management of interconnected surface water. The GSAs acknowledge, and the Department agrees, that many data gaps related to interconnected surface water exist. The GSAs should continue filling data gaps, collecting additional monitoring data, and coordinating with resources agencies and interested parties to understand beneficial uses and users that may be impacted by depletions of interconnected surface water caused by groundwater pumping. Future periodic evaluations of the Plan and amendments to the Plan should aim to improve the initial sustainable management criteria as more information and improved methodology becomes available.
3. Projections of future basin extractions are likely to stay within current and historic ranges, at least until the next periodic evaluation by the GSAs and the Department. Basin groundwater levels and other SGMA sustainability indicators are unlikely to substantially deteriorate while the GSAs implement the Department's recommended corrective actions. State intervention is not necessary at this time to ensure that local agencies manage groundwater in a sustainable manner. (Wat. Code § 10720.1(h).)
4. The California Environmental Quality Act (Public Resources Code § 21000 *et seq.*) does not apply to the Department's evaluation and assessment of the Plan.

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Accordingly, the GSP submitted by the Agencies for the Santa Ynez River Valley Basin is hereby **APPROVED**. The recommended corrective actions identified in the Staff Report will assist the Department's future review of the Plan's implementation for consistency with SGMA and the Department therefore recommends the Agencies address them by the time of the Department's periodic review, which is set to begin on January 18, 2027, as required by Water Code § 10733.8. Failure to address the Department's recommended corrective actions before future, subsequent plan evaluations, may lead to a Plan being determined incomplete or inadequate.

Signed:

Karla Nemeth
Karla Nemeth, Director
Date: January 18, 2024

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Santa Ynez River Valley Basin

**State of California
Department of Water Resources
Sustainable Groundwater Management Program
Groundwater Sustainability Plan Assessment
Staff Report**

Groundwater Basin Name:	Santa Ynez River Valley Basin (No. 3-015)
Submitting Agencies:	Western Management Area Groundwater Sustainability Agency, Central Management Area Groundwater Sustainability Agency, Eastern Area Groundwater Sustainability Agency
Submittal Type:	Initial GSP Submission
Submittal Date:	January 18-19, 2022
Recommendation:	Approved
Date:	January 18, 2024

Multiple groundwater sustainability agencies (GSAs) submitted multiple groundwater sustainability plans (GSPs or Plans) for the entire Santa Ynez River Valley Basin (Basin), which are coordinated pursuant to a required coordination agreement, to the Department of Water Resources (Department) for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)¹ and GSP Regulations.² In total, three GSPs have been adopted and are being implemented by the three respective GSAs. Collectively, all GSPs and the coordination agreement are, for evaluation and assessment purposes, treated and referred to as the Plan for the Basin. Individually, the GSPs include the following:

- Western Management Area GSP – prepared by Western Management Area GSA (WMA)
- Central Management Area GSP – prepared by Central Management Area GSA (CMA)
- Eastern Management Area GSP – prepared by Eastern Management Area GSA (EMA)

After evaluation and assessment, Department staff conclude that the Plan includes the required components of a GSP, demonstrates a thorough understanding of the Basin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent undesirable results as defined in the Plan, and proposes a set of projects and

¹ Water Code § 10720 *et seq.*

² 23 CCR § 350 *et seq.*

management actions that will likely achieve the sustainability goal defined for the Basin.³ Department staff will continue to monitor and evaluate the Basin's progress toward achieving the sustainability goal through annual reporting and future periodic evaluations of the GSPs and their implementation.

- ***Based on the current evaluation of the Plan, Department staff recommend the GSP be approved with the recommended corrective actions described herein.***

This assessment includes five sections:

- **Section 1 – Summary**: Provides an overview of Department staff's assessment and recommendations.
- **Section 2 – Evaluation Criteria**: Describes the legislative requirements and the Department's evaluation criteria.
- **Section 3 – Required Conditions**: Describes the submission requirements, Plan completeness, and basin coverage required for a GSP to be evaluated by the Department.
- **Section 4 – Plan Evaluation**: Provides an assessment of the contents included in the GSP organized by each Subarticle outlined in the GSP Regulations.
- **Section 5 – Staff Recommendation**: Includes the staff recommendation for the Plan and any recommended or required corrective actions, as applicable.

1 SUMMARY

Department staff recommend approval of the Plan. The GSAs have identified areas for improvement of their Plan (e.g., better understanding pumping from the Santa Ynez River Alluvium, filling data gaps related to interconnected surface water). Department staff concur that those items are important and recommend the GSAs address them as soon as possible. Department staff have also identified additional recommended corrective actions within this assessment that the GSAs should consider addressing by the first periodic evaluation of the Plan. The recommended corrective actions generally focus on the following:

- (1) Incorporating the action plan associated with the management of the Santa Ynez River Alluvium into the GSP and GSP implementation.
- (2) Filling data gaps and better understanding the principal aquifers.
- (3) Evaluating methodologies and terminology in the water budgets for better consistency across the three management areas.
- (4) Reevaluating the sustainable management criteria for the chronic lowering of groundwater levels.
- (5) Reevaluating the sustainable management criteria for the degradation of water quality.

³ 23 CCR § 350 *et seq.*

- (6) Addressing inconsistencies in the sustainable management criteria for land subsidence.
- (7) Reevaluating the sustainable management criteria for the depletions of interconnected surface water.

Addressing the recommended corrective actions identified in [Section 5](#) of this assessment will be important to demonstrate, on an ongoing basis, that implementation of the Plan is likely to achieve the sustainability goal.

2 EVALUATION CRITERIA

The GSAs submitted multiple GSPs to the Department to evaluate whether the Plans conforms to specified SGMA requirements⁴ and is likely to achieve the sustainability goal for the Santa Ynez River Valley Basin.⁵ To achieve the sustainability goal for the Basin, the GSP must demonstrate that implementation of the Plans will lead to sustainable groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.⁶ Undesirable results must be defined quantitatively by the GSAs.⁷ The Department is also required to evaluate whether the Plans will adversely affect the ability of an adjacent basin to implement its GSP or achieve its sustainability goal.⁸

For the GSPs to be evaluated by the Department, it must first be determined that the Plans were submitted by the statutory deadline,⁹ and that they are complete and cover the entire basin.¹⁰ If these conditions are satisfied, the Department evaluates the Plans to determine whether they comply with specific SGMA requirements and substantially comply with the GSP Regulations.¹¹ Substantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plans, and the Department determines that any discrepancy would not materially affect the ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plans to attain that goal.¹²

When evaluating whether the Plans are likely to achieve the sustainability goal for the Basin, Department staff reviewed the information provided and relied upon in the Plans for sufficiency, credibility, and consistency with scientific and engineering professional

⁴ Water Code §§ 10727.2, 10727.4.

⁵ Water Code § 10733(a).

⁶ Water Code § 10721(v).

⁷ 23 CCR § 354.26 *et seq.*

⁸ Water Code § 10733(c).

⁹ 23 CCR § 355.4(a)(1).

¹⁰ 23 CCR §§ 355.4(a)(2), 355.4(a)(3).

¹¹ 23 CCR § 350 *et seq.*

¹² 23 CCR § 355.4(b).

standards of practice.¹³ The Department's review considers whether there is a reasonable relationship between the information provided and the assumptions and conclusions made by the GSAs, including whether the interests of the beneficial uses and users of groundwater in the basin have been considered; whether sustainable management criteria and projects and management actions described in the Plans are commensurate with the level of understanding of the basin setting; and whether those projects and management actions are feasible and likely to prevent undesirable results.¹⁴

The Department also considers whether the GSAs have the legal authority and financial resources necessary to implement the Plans.¹⁵

To the extent overdraft is present in a basin, the Department evaluates whether the Plans provide a reasonable assessment of the overdraft and includes reasonable means to mitigate the overdraft.¹⁶ The Department also considers whether the Plans provide reasonable measures and schedules to eliminate identified data gaps.¹⁷ Lastly, the Department's review considers the comments submitted on the Plans and evaluates whether the GSAs adequately responded to the comments that raise credible technical or policy issues with the Plans.¹⁸

The Department is required to evaluate the GSPs within two years of their submittal date and issue a written assessment of the Plan.¹⁹ The assessment is required to include a determination of the Plan's status.²⁰ The GSP Regulations define the three options for determining the status of a Plan: Approved,²¹ Incomplete,²² or Inadequate.²³

Even when review indicates that the Plans satisfy the requirements of SGMA and are in substantial compliance with the GSP Regulations, the Department may recommend corrective actions.²⁴ Recommended corrective actions are intended to facilitate progress in achieving the sustainability goal within the basin and the Department's future evaluations, and to allow the Department to better evaluate whether the Plans adversely affect adjacent basins. While the issues addressed by the recommended corrective actions do not, at this time, preclude approval of the Plans, the Department recommends that the issues be addressed to ensure the Plan's implementation continues to be consistent with SGMA and the Department is able to assess progress in achieving the

¹³ 23 CCR § 351(h).

¹⁴ 23 CCR §§ 355.4(b)(1), (3), (4), and (5).

¹⁵ 23 CCR § 355.4(b)(9).

¹⁶ 23 CCR § 355.4(b)(6).

¹⁷ 23 CCR § 355.4(b)(2).

¹⁸ 23 CCR § 355.4(b)(10).

¹⁹ Water Code § 10733.4(d); 23 CCR § 355.2(e).

²⁰ Water Code § 10733.4(d); 23 CCR § 355.2(e).

²¹ 23 CCR § 355.2(e)(1).

²² 23 CCR § 355.2(e)(2).

²³ 23 CCR § 355.2(e)(3).

²⁴ Water Code § 10733.4(d).

sustainability goal within the basin.²⁵ Unless otherwise noted, the Department proposes that recommended corrective actions be addressed by the submission date for the first periodic evaluation.²⁶

The staff assessment of the Plans involves the review of information presented by the GSAs, including models and assumptions, and an evaluation of that information based on scientific reasonableness, including standard or accepted professional and scientific methods and practices. The assessment does not require Department staff to recalculate or reevaluate technical information provided in the Plans or to perform their own geologic or engineering analysis of that information. The staff recommendation to approve the Plans does not signify that Department staff, were they to exercise the professional judgment required to develop a GSP for the basin, would make the same assumptions and interpretations as those contained in the Plans, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSAs are supported by adequate, credible evidence, and are scientifically reasonable.

Lastly, the Department's review and approval of the Plans is a continual process. Both SGMA and the GSP Regulations provide the Department with the ongoing authority and duty to review the implementation of the Plans.²⁷ Also, GSAs have an ongoing duty to provide reports to the Department, periodically reassess their Plans, and, when necessary, update or amend their plans.²⁸ The passage of time or new information may make what is reasonable and feasible at the time of this review to not be so in the future. The emphasis of the Department's periodic reviews will be to assess the progress toward achieving the sustainability goal for the basin and whether Plans implementation adversely affects the ability of adjacent basins to achieve their sustainability goals.

3 REQUIRED CONDITIONS

A GSP, to be evaluated by the Department, must be submitted within the applicable statutory deadline. The GSP must also be complete and must, either on its own or in coordination with other GSPs, cover the entire basin.

3.1 SUBMISSION DEADLINE

SGMA required basins categorized as high- or medium-priority and not subject to critical conditions of overdraft to submit a GSP no later than January 31, 2022.²⁹

The GSAs submitted their Plans between January 18 and 19, 2022.

²⁵ Water Code § 10733.8.

²⁶ 23 CCR § 356.4 *et seq.*

²⁷ Water Code § 10733.8; 23 CCR § 355.6.

²⁸ Water Code §§ 10728 *et seq.*, 10728.2.

²⁹ Water Code § 10720.7(a)(2).

3.2 COMPLETENESS

GSP Regulations specify that the Department shall evaluate a GSP if that GSP is complete and includes the information required by SGMA and the GSP Regulations.³⁰

The GSAs submitted adopted GSPs for the entire Basin. After an initial, preliminary review, Department staff found the GSPs to be complete and appearing to include the required information, sufficient to warrant a thorough evaluation by the Department.³¹ The Department posted the GSPs to its website on January 31, 2022.³²

3.3 BASIN COVERAGE

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.³³ A GSP that is intended to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting GSA(s).

The jurisdictional boundary of the submitting GSAs fully contains the Basin,³⁴ and the CMA GSP asserts “[t]he entire [Basin] is covered by one of [the coordinated plans] prepared for the Basin.”³⁵ Elsewhere, however, the Plan expressly indicates the GSAs do not intend to manage a portion of the Basin termed the Santa Ynez River Alluvium, because the GSAs claim that the “[a]lluvium is considered surface water under the regulatory jurisdiction of the [State Water Resources Control Board (SWRCB)] and is not managed under SGMA.”³⁶ The coordinated GSPs state that the Santa Ynez River Alluvium area “is not [to] be managed by the CMA GSA” and “is not managed by the EMA GSA under SGMA,” respectively.³⁷ During the review period, the Department received a comment letter from the SWRCB stating “the assertion that all underground water in the Santa Ynez River Alluvium is surface water managed by the [SWRCB] is not correct, and it appears that it will be necessary to treat this area as an unmanaged area under [SGMA].”³⁸ Thus, there appears to be a jurisdictional question or dispute regarding the legal characterization and jurisdiction over extraction of water from beneath the ground by wells in the alluvium area along the Santa Ynez River. Department staff are not

³⁰ 23 CCR § 355.4(a)(2).

³¹ The Department undertakes a preliminary completeness review of a submitted Plan under section 355.4(a) of the GSP Regulations to determine whether the elements of a Plan required by SGMA and the Regulations have been provided, which is different from a determination, upon review, that a Plan is “incomplete” for purposes of section 355.2(e)(2) of the Regulations.

³² <https://sgma.water.ca.gov/portal/gsp/preview/80>, <https://sgma.water.ca.gov/portal/gsp/preview/79>, <https://sgma.water.ca.gov/portal/gsp/preview/78>.

³³ Water Code § 10727(b); 23 CCR § 355.4(a)(3).

³⁴ Santa Ynez River Valley Western Management Area GSP, Section 1d.1-2, p. 101; Santa Ynez River Valley Central Management Area GSP, Section 1d.1-2, p. 94; Santa Ynez River Valley Eastern Management Area GSP, Section 2.2, p. 62.

³⁵ Santa Ynez River Valley Central Management Area GSP, Section 1d.1-2, p. 94.

³⁶ Santa Ynez River Valley Eastern Management Area GSP, Executive Summary, p. ES-3.

³⁷ Santa Ynez River Valley Central Management Area GSP, Executive Summary, p. ES-2; Santa Ynez River Valley Eastern Management Area GSP, Executive Summary, p. ES-6.

³⁸ SWRCB April 14, 2023 comment letter submitted to the Department's SGMA Portal <https://sgma.water.ca.gov/portal/service/gspdocument/download/9653>

required to and cannot resolve this issue. However, Department staff remain concerned that extraction by wells in the alluvium area—if left unmanaged and unaccounted for—could affect implementation of the GSP and affect the likelihood of achieving sustainability in the Basin, because it appears that these wells are numerous and extract substantial amounts of water. After a series of meetings between the Department, the State Water Board, and the Agencies, the GSAs (by letter dated January 5, 2024) indicated they developed and intend to implement an action plan designed to gather detailed information and eliminate regulatory uncertainty regarding the wells and pumping in the Santa Ynez River Alluvium area.³⁹ The SWRCB commented (by letter dated January 16, 2024) that “[i]mplementation of the action plan should help to develop information needed to sustainably manage the basin and provide a better understanding of interconnections and interactions between groundwater and surface water in the Santa Ynez River watershed.” At this time, the GSAs’ commitment to implement the proposed action plan assuages Department staff’s concerns, but Department staff recommend including implementation of this program as a recommended corrective action and will track progress through review of annual reports and in the Department’s periodic review (see [Recommended Corrective Action 1](#)).

4 PLAN EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin “shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act.” The Department’s assessment is based on a number of related factors including whether the elements of the GSPs were developed in the manner required by the GSP Regulations, whether the GSPs were developed using appropriate data and methodologies and whether their conclusions are scientifically reasonable, and whether the GSPs, through the implementation of clearly defined and technically feasible projects and management actions, are likely to achieve a tenable sustainability goal for the basin. The Department staff’s evaluation of the likelihood of the Plans to attain the sustainability goal for the Basin is provided below.

4.1 ADMINISTRATIVE INFORMATION

The GSP Regulations require each Plan to include administrative information identifying the submitting Agency, its decision-making process, and its legal authority;⁴⁰ a description of the Plan area and identification of beneficial uses and users in the Plan area;⁴¹ and a

³⁹ Action Plan for Management of All Well Production Along the Lower Santa Ynez River, Above the Lompoc Narrows: <https://sgma.water.ca.gov/portal/service/gspdocument/download/9990>

⁴⁰ 23 CCR § 354.6 *et seq.*

⁴¹ 23 CCR § 354.8 *et seq.*

description of the ability of the submitting Agency to develop and implement a Plan for that area.⁴²

The Santa Ynez River Valley Basin is divided into three management areas (Figure 1): the Western Management Area managed by Western Management Area Groundwater Sustainability Agency (WMA GSA), the Central Management Area managed by Central Management Area Groundwater Sustainability Agency (CMA GSA), and the Eastern Management Area managed by Eastern Management Area Groundwater Sustainability Agency (EMA GSA). Each of the three GSAs have individually developed a GSP which is coordinated pursuant to a single coordination agreement.⁴³

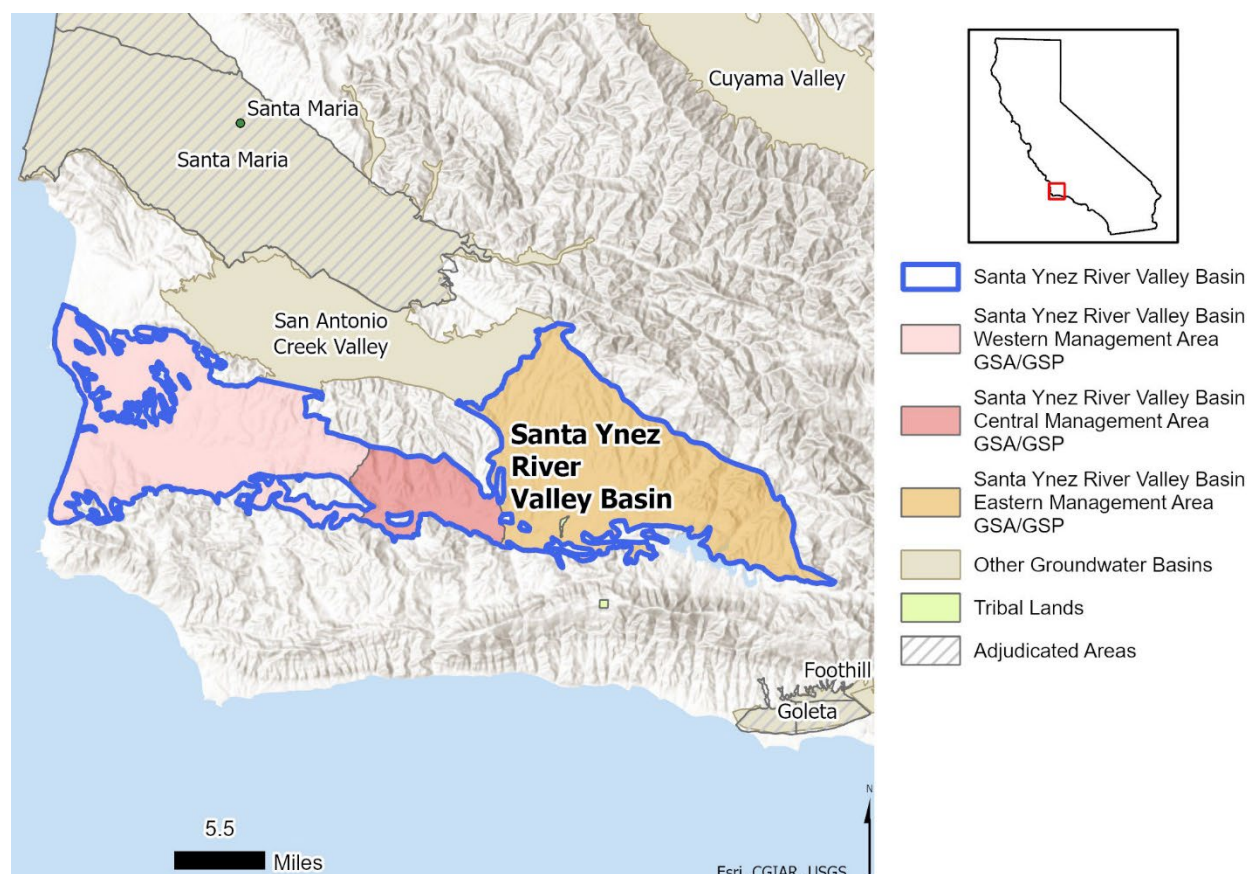


Figure 1: Santa Ynez River Valley Basin and GSP Location Map.

The Basin underlies the cities of Solvang, Buellton, and Lompoc, and the unincorporated communities of Santa Ynez, Ballard, Los Olivos, Acorn, Mission Hills, and Vandenberg Village. The Basin is bounded by the Pacific Ocean on the west, the Purisima Hills and San Rafael Mountains on the north, the Santa Ynez Mountains on the south, and consolidated non-water-bearing rocks of Mesozoic and Tertiary age on the east. These consolidated rocks underlie the unconsolidated water-bearing deposits of Tertiary and

⁴² 23 CCR § 354.6(e).

⁴³ Santa Ynez River Valley Western Management Area GSP, Appendix 1b-D, pp. 779-793.

Quaternary age that comprise the Basin and define the Basin's lower boundary (bottom of basin). To the north, the Basin boundary is also coincident with the boundary of the San Antonio Creek Valley Groundwater Basin (No. 3-014), for portions of the WMA and EMA management areas.⁴⁴

The WMA encompasses the westernmost approximately 133.7 square miles (85,595.5 acres) of the Basin. The WMA is divided into six subareas based on hydrogeologic and topographic characteristics: Lompoc Plain, Lompoc Terrace, Lompoc Upland, Santa Rita Upland, Santa Ynez River Alluvium, and Burton Mesa.⁴⁵

The member agencies for the WMA GSA are the City of Lompoc, the Vandenberg Village Community Services District, the Mission Hills Community Services District, the Santa Ynez River Water Conservation District, and the Santa Barbara County Water Agency.⁴⁶ The WMA is governed by a committee of representatives from each member agency which has four voting committee members and one non-voting committee member. The Santa Ynez River Water Conservation District representative has four votes, the City of Lompoc representative has two votes, and the Vandenberg Village Community Services District and Mission Hills Community Services District representatives each have one vote. The Santa Barbara County Water Agency representative is a non-voting member of the GSA. The Santa Barbara County Water Agency is represented by the Board of Supervisors for Santa Barbara County, serving as Water Agency Directors.⁴⁷

The Plan notes that beneficial uses and users in the WMA Plan Area include, but are not limited to, holders of overlying groundwater rights; municipal, domestic and agricultural well operators; public water systems; local land use planning agencies; environmental users of groundwater; surface water users; federal government; and disadvantaged communities.⁴⁸ Surface water flows of the Santa Ynez River are managed by the SWRCB under Order WR 2019-0148.⁴⁹

The CMA encompasses approximately 32.8 square miles (21,023.8 acres) of the center of the Basin. The Plan explains that the CMA is divided into two subareas based on hydrogeologic and topographic characteristics: Buellton Upland and Santa Ynez River Alluvium.⁵⁰

The member agencies for the CMA GSA are the Santa Ynez River Water Conservation District, the Santa Barbara County Water Agency, and the City of Buellton.⁵¹ The CMA GSA is governed by a committee of representatives from each member agency. There are two voting committee members representing the Santa Ynez River Water

⁴⁴ Santa Ynez River Valley Western Management Area GSP, Section 1d.1-1, p. 101.

⁴⁵ Santa Ynez River Valley Western Management Area GSP, Section 1d.1-3, p. 101.

⁴⁶ Santa Ynez River Valley Western Management Area GSP, Section 1a, p. 65.

⁴⁷ Santa Ynez River Valley Western Management Area GSP, Section 1b.1-2, p. 81.

⁴⁸ Santa Ynez River Valley Western Management Area GSP, Section 1d.5-1-1, pp. 144-145.

⁴⁹ Santa Ynez River Valley Western Management Area GSP, Section 2a.4-6-1, p. 296.

⁵⁰ Santa Ynez River Valley Central Management Area GSP, Section 1d.1-3, p. 93.

⁵¹ Santa Ynez River Valley Central Management Area GSP, Section 1a, p. 61.

Conservation District and City of Buellton, and one non-voting committee member representing the Santa Barbara County Water Agency. The Plan states that the Santa Barbara County Water Agency is represented by a person or persons as appointed by the Board of Supervisors for Santa Barbara County, serving as Water Agency Directors.⁵² The GSA indicates their legal authority comes from obtaining GSA status for the management area.⁵³

The Plan notes that beneficial uses and users in the CMA Plan Area include, but are not limited to, holders of overlying groundwater rights; municipal, domestic, and agricultural well operators; public water systems; local land use planning agencies; environmental users of groundwater; surface water users; federal government; and disadvantaged communities.⁵⁴

The EMA encompasses approximately 150 square miles (96,000 acres).⁵⁵ The EMA Plan area is divided into two main areas: the Santa Ynez Uplands and the Santa Ynez River areas. The Plan states that the “Santa Ynez Uplands covers a majority of the EMA, including the northern 130 square miles (87 percent) of the 150 square miles of the EMA.”⁵⁶

The member agencies for the EMA GSA are the Santa Ynez River Water Conservation District; the Santa Barbara County Water Agency; the City of Solvang; and the Santa Ynez River Water Conservation District, Improvement District No. 1.⁵⁷ The EMA GSA is governed by a five-member board of directors. Directors are elected by the registered voters in Santa Ynez River Water Conservation District boundaries to staggered 4-year terms.⁵⁸ The 2017 memorandum of agreement for the GSA Committee granted it authority to have “all powers that a GSA is authorized to exercise as provided by SGMA.”⁵⁹

The Plan notes that the beneficial uses and users in the EMA Plan Area include holders of overlying groundwater rights; municipal, domestic, and agricultural well operators; public water systems; environmental users of groundwater; surface water users; and the Santa Ynez Band of Chumash Indians.⁶⁰ No disadvantaged communities were identified within the EMA. The Plan states that “currently, the Chumash tribal government is participating in the SGMA process for the EMA GSA through its representation on the Citizens Advisory Group.”⁶¹ Regarding environmental users of surface water, the EMA GSA notes that it is “fully supportive of the comprehensive and ongoing efforts ... to

⁵² Santa Ynez River Valley Central Management Area GSP, Section 1b.1-2, p. 77.

⁵³ Santa Ynez River Valley Central Management Area GSP, Section 1b.1-3, p. 77.

⁵⁴ Santa Ynez River Valley Central Management Area GSP, Section 1d.5-1-1, p. 133.

⁵⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.1, p. 104.

⁵⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.1, p. 105.

⁵⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 2.1, p. 57.

⁵⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 2.1.2.1, p. 58.

⁵⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 2.1.4, p. 61.

⁶⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 2.3.1, p. 94.

⁶¹ Santa Ynez River Valley Eastern Management Area GSP, Section 2.2.1.4, p. 67.

develop and implement surface flow and non-flow measures in the mainstem lower Santa Ynez River and certain tributaries for the protection of public trust resources, including but not limited to steelhead and its critical habitat within the Santa Ynez River.”⁶²

The Plan cites several potential options for funding GSP implementation — such as cost sharing, extraction fees, grants, etc.

Department staff conclude the Plan’s discussion and presentation of administrative material covers the specific items listed in the GSP Regulations⁶³ in an understandable format using appropriate information. Staff are aware of no significant inconsistencies or contrary information to that presented in the Plan and therefore have no significant concerns regarding the quality and discussion of the administrative section the Plan.

4.2 BASIN SETTING

GSP Regulations require information about the physical setting and characteristics of the basin and current conditions of the basin, including a hydrogeologic conceptual model; a description of historical and current groundwater conditions; and a water budget accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.⁶⁴

4.2.1 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model is a non-numerical model of the physical setting, characteristics, and processes that govern groundwater occurrence within a basin, and represents a local agency’s understanding of the geology and hydrology of the basin that support the geologic assumptions used in developing mathematical models, such as those that allow for quantification of the water budget.⁶⁵ The GSP Regulations require a descriptive hydrogeologic conceptual model that includes a written description of geologic conditions, supported by cross sections and maps,⁶⁶ and includes a description of basin boundaries and the bottom of the basin,⁶⁷ principal aquifers and aquitards,⁶⁸ and data gaps.⁶⁹

The Plan describes the Santa Ynez River Valley Basin as an “east/west-trending, linear, irregular structural depression between rugged mountain ranges and hills in Santa

⁶² Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.6, p. 189.

⁶³ 23 CCR §§ 354.6, 354.8, 354.10.

⁶⁴ 23 CCR § 354.12.

⁶⁵ DWR Best Management Practices for the Sustainable Management of Groundwater: Hydrogeologic Conceptual Model, December 2016: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-3-Hydrogeologic-Conceptual-Model_ay_19.pdf.

⁶⁶ 23 CCR §§ 354.14 (a), 354.14 (c).

⁶⁷ 23 CCR §§ 354.14 (b)(2-3).

⁶⁸ 23 CCR § 354.14 (b)(4) *et seq.*

⁶⁹ 23 CCR § 354.14 (b)(5).

Barbara County, California.”⁷⁰ The Basin spans approximately 317 square miles⁷¹ and is bounded by the Purisima Hills on the northwest, the San Rafael Mountains on the northeast, the Santa Ynez Mountains on the south, and the Pacific Ocean on the west.⁷² The Plan notes that the Basin is primarily filled with alluvial deposits and has large anticline-syncline pairs as primary structural features.⁷³ Unconsolidated sediments form much of the water-bearing principal aquifers within the Basin.⁷⁴

Western Management Area GSP

The Plan states that the WMA boundary encompasses the westernmost approximately 133.7 square miles (85,595.5 acres) of the Basin.⁷⁵ The WMA Plan identifies two principal aquifers that are referred to as the Upper Aquifer and the Lower Aquifer.⁷⁶ The WMA Plan describes in detail the various deposits, formations, and structures within the Plan area. The significant unconsolidated units and their aquifer assignment are as follows:⁷⁷

Upper Aquifer units:

- River Channel Deposits (Qg): within the modern-day Santa Ynez River channel and consists of fine-to-coarse sand, gravels, and thin discontinuous lenses of clay and silt.
- Alluvium (fluvial-Qal): composed of a coarse sand upper member and a fine sand lower member.

Lower Aquifer units

- Terrace Deposits / Older Alluvium (fluvial-Qoa): consists of unconsolidated to poorly consolidated sands and gravels with common silt and clay zones.
- Orcutt Sand (eolian/nonmarine-Qo): consists of unconsolidated, well sorted, coarse to medium sand and clayey sand with scattered pebbles and gravel stringers.
- Paso Robles Formation (Alluvial fans-QTp): consists of poorly consolidated to unconsolidated, poorly sorted, gravels, sands, silts, and clays.
- Careaga Sand (marine-Tca): consists of massive, fine-to-coarse sand, with lenses of gravel and fossil shells. Often differentiated into the upper coarse

⁷⁰ Santa Ynez River Valley Western Management Area GSP, Section 2a.1, p. 191.

⁷¹ Santa Ynez River Valley Western Management Area GSP, Executive Summary, p. 50.

⁷² Santa Ynez River Valley Western Management Area GSP, Appendix 2a-A, p. 984.

⁷³ Santa Ynez River Valley Western Management Area GSP, Appendix 2a-A, pp. 984-986.

⁷⁴ Santa Ynez River Valley Western Management Area GSP, Section 2a, pp. 195-210.

⁷⁵ Santa Ynez River Valley Western Management Area GSP, Section 1d.1-3, p. 101.

⁷⁶ Santa Ynez River Valley Western Management Area GSP, Section 2a.2, p. 209, Section 2a.2-2, p. 211, Section 2a.4, p. 296, Section 2b.6-3, p. 415.

⁷⁷ Santa Ynez River Valley Western Management Area GSP, Appendix 2a-A, Section 1.1, pp. 984-988.

sand Graciosa Member (Tcag) and the lower, fine sand Cebada Member (Tcac).

Bottom of Basin - The bottom of the Basin in the WMA Plan area is defined as the contact between consolidated Tertiary-Mesozoic age deposits or rock and the overlying unconsolidated deposits (younger than or equal to the Careaga Formation).⁷⁸

The Plan provides a map⁷⁹ depicting the aerial extent of the principal aquifers as well as an isopach map⁸⁰ depicting aquifer thickness within the WMA, which ranges from 500 feet thick around much of the perimeter to 2,000 feet in the eastern portion of the Plan area. The Plan used borehole data distributed across the Basin from publicly available resources (i.e., well records from DWR, California Department of Public Health, California Geologic Energy Management Division, and existing literature and reports) to create the Regional Geology and 3D Geologic Model that was used to generate the associated maps.⁸¹

The Plan explains that the “Lower Aquifer units are older and more consolidated than younger alluvial formations that make up the Upper Aquifer” and that the “Lower Aquifer units lie unconformably beneath the Upper Aquifer units.” The Plan notes that both the upper and lower aquifers are used for agriculture, domestic, municipal, and industrial purposes.⁸² The Upper Aquifer is found in the Lompoc Plain and partially in the Lompoc Terrace adjacent to the Lompoc Plain.⁸³ The Plan states that most groundwater extracted from the Upper Aquifer is from the alluvial area (Qa) of the Lompoc Plain. The Lower Aquifer consists primarily of the Paso Robles and Careaga Sand formations.⁸⁴ The Graciosa Member of the Careaga Sand Formation is described as the main producer of groundwater in the Lower Aquifer. The Lower Aquifer is the primary aquifer in the Lompoc Terrace and Lompoc Upland. The Plan states that groundwater in the Lower Aquifer ranges from unconfined to confined in the Lompoc Upland and is confined in the Lompoc Plain.⁸⁵

The Plan includes five cross-sections that depict stratigraphic and structural features in the Plan area.⁸⁶ However, Department staff note that the cross-sections lack sufficient detail for analysis and could be improved with increased vertical exaggeration. The Plan also provides sufficiently detailed maps that depict topography, surficial geology, soil characteristics, recharge areas, surface water bodies, and source and point of delivery of

⁷⁸ Santa Ynez River Valley Western Management Area GSP, Section 2a.2, p. 210.

⁷⁹ Santa Ynez River Valley Western Management Area GSP, Figure 2a.2-3, p. 217.

⁸⁰ Santa Ynez River Valley Western Management Area GSP, Figure 2a.2-2, p. 215.

⁸¹ Santa Ynez River Valley Western Management Area GSP, Appendix 2a-A, pp. 988-995.

⁸² Santa Ynez River Valley Western Management Area GSP, Section 2a.4, p. 273.

⁸³ Santa Ynez River Valley Western Management Area GSP, Section 2a.2-2-1, p. 212.

⁸⁴ Santa Ynez River Valley Western Management Area GSP, Section 2a.2-2-1, p. 212.

⁸⁵ Santa Ynez River Valley Western Management Area GSP, Section 2a.2-2-2, p. 233.

⁸⁶ Santa Ynez River Valley Western Management Area GSP, Figures 2a.1-3a through 2a.1-3c, pp. 203-207.

imported water supplies that characterizes the physical components and interaction of the surface water and groundwater systems in the Plan area.⁸⁷

The Plan acknowledges that the amount of surface water leaving the WMA Plan area (entering the Pacific Ocean) is a data gap in the Hydrogeologic Conceptual Model.⁸⁸ The Plan notes that a gauge is proposed for installation near the mouth of the Santa Ynez River.⁸⁹

Central Management Area GSP

The CMA boundary encompasses approximately 32.8 square miles (21,023.8 acres) of the center of the Basin.⁹⁰ The Plan identifies one principal aquifer for the CMA, referred to as the Buellton Aquifer. The CMA Plan describes in detail the various deposits, formations, and structures within the Plan area. The significant unconsolidated units and their aquifer assignment are as follows:⁹¹

- River Channel Deposits (Qg): within the modern-day Santa Ynez River channel and consists of fine-to-coarse sand, gravels, and thin discontinuous lenses of clay and silt.
- Alluvium (fluvial-Qal): composed of a coarse sand upper member and a fine sand lower member.
- Terrace Deposits / Older Alluvium (fluvial-Qoa): consists of unconsolidated to poorly consolidated sands and gravels with common silt and clay zones.
- Orcutt Sand (eolian/nonmarine-Qo): consists of unconsolidated, well sorted, coarse to medium sand and clayey sand with scattered pebbles and gravel stringers.

Buellton Aquifer

- Paso Robles Formation (Alluvial fans-QTp): consists of poorly consolidated to unconsolidated, poorly sorted, gravels, sands, silts, and clays.
- Careaga Sand (marine-Tca): consists of massive, fine-to-coarse sand, with lenses of gravel and fossil shells. Often differentiated into the upper coarse sand Graciosa Member (Tcag) and the lower, fine sand Cebada Member (Tcac).

Bottom of Basin - The bottom of the Basin in the CMA Plan area is defined as the contact between consolidated Tertiary-Mesozoic age deposits or rock and the

⁸⁷ Santa Ynez River Valley Western Management Area GSP, Figure 2a.1-2, p. 201, Figure 2a.3-1, p. 243, Figure 2a.3-4, p. 249, Figures 2a.3-9 through 2a.3-10, pp. 265-267.

⁸⁸ Santa Ynez River Valley Western Management Area GSP, Section 2a.5, p. 298.

⁸⁹ Santa Ynez River Valley Western Management Area GSP, Section 5a.2-4, p. 662.

⁹⁰ Santa Ynez River Valley Central Management Area GSP, Section 1d.1-3, p. 94.

⁹¹ Santa Ynez River Valley Central Management Area GSP, Section 2a.1-1-1, pp. 179-182.

overlying unconsolidated deposits (younger than or equal to the Careaga Formation).⁹²

The combined thickness of the portion of the Basin (i.e., depth of unconsolidated deposits) within the CMA Plan area ranges from “less than 100 feet along the border of the synclinal structure to over 2,000 feet along the approximate axis of the Santa Rita Syncline in the Buellton Upland.”⁹³ The Plan explains that the Buellton Aquifer is not present in the southern portion of Plan area referred to as the Santa Ynez River Alluvium (west of the Santa Ynez River’s Buellton Bend). The Plan references a shale bedrock that underlies the river alluvium in the area.⁹⁴

The Buellton Aquifer consists of the non-marine Paso Robles Formation and the underlying marine Careaga Formation and has similarities to the Lower Aquifer in the WMA of the Basin.⁹⁵ Wells completed in the Paso Robles Formation yield from 200 to 1,000 gallons per minute. In the upland deposits, the Paso Robles Formation is described as often completely unsaturated.⁹⁶ The Careaga Formation has two sub-members including the upper Graciosa Member and the lower Cebada Member. The Graciosa Member is the main producer of groundwater in the Buellton Aquifer.

The Plan does not include Alluvium (Qal) or Older Alluvium (Qoa) as part of the Buellton Aquifer nor designate them as a separate principal aquifer. Department staff note that Alluvium (Qal) is described as the principal source of groundwater in the Lompoc Plain area within the WMA Plan area,⁹⁷ yet no explanation is provided for why the various alluvial deposits are excluded from the principal aquifer within the CMA. Department staff suggest the GSP include additional information to explain the rationale for excluding alluvial deposits from the principal aquifer designation in the CMA.

The Plan includes four cross-sections that depict stratigraphic and structural features in the Plan area.⁹⁸ However, the cross-sections lack sufficient detail for analysis and could be improved with increased vertical exaggeration. The GSP also provides sufficiently detailed maps that depict topography, surficial geology, soil characteristics, recharge areas, surface water bodies, and source and point of delivery of imported water supplies that characterizes the physical components and interaction of the surface water and groundwater systems in the CMA.⁹⁹

The Plan identifies the following data gaps in the Hydrogeologic Conceptual Model for the CMA: uncertainty of the geologic structure and model in the eastern portion of Plan area

⁹² Santa Ynez River Valley Central Management Area GSP, Section 2a.2-1-1, pp. 197-198.

⁹³ Santa Ynez River Valley Central Management Area GSP, Section 2a.2-1-1, p. 198.

⁹⁴ Santa Ynez River Valley Central Management Area GSP, Figure 2b.6-3, p. 365.

⁹⁵ Santa Ynez River Valley Central Management Area GSP, Section 2a.2, pp. 203 - 211.

⁹⁶ Santa Ynez River Valley Central Management Area GSP, Section 2a.2-2-1, p. 203.

⁹⁷ Santa Ynez River Valley Central Management Area GSP, Section 2a.1-1-1, p. 180.

⁹⁸ Santa Ynez River Valley Central Management Area GSP, Figures 2a.1-2 through 2a.1-3c, pp. 185-191.

⁹⁹ Santa Ynez River Valley Central Management Area GSP, Figure 2a.1-1, p. 177, Figure 2a.2-6, p. 213; Figures 2a.3-1 through 2a.3-10, pp. 223-251.

due to limited borehole or well information deeper than 120 feet;¹⁰⁰ limited geologic mapping in the Buellton Upland subarea of the contact between the coarser Careaga Graciosa Member (upper unit) and less permeable Careaga Cebada Member;¹⁰¹ lack of water level data to document the hydraulic gradient between the Buellton Upland and the Santa Rita subarea to the west, between the Buellton Upland and Santa Ynez River Alluvium to the south, and between the Buellton Upland and the Santa Ynez Upland to the east;¹⁰² and lack of precise understanding of conditions in the Buellton Aquifer in the Santa Ynez River Alluvium subarea.¹⁰³

The Plan's implementation section includes activities associated with filling one or more of the above data gaps. Projects like airborne geophysics,¹⁰⁴ adding additional wells¹⁰⁵ and dedicated monitoring wells¹⁰⁶ aim to better characterize the subsurface and groundwater levels.

Eastern Management Area GSP

The EMA boundary encompasses approximately 130 square miles (83,200 acres) at the eastern end of the Basin.¹⁰⁷ The Plan identifies two principal aquifers, referred to as the Paso Robles Formation, which includes Older Alluvium, and the Careaga Sand.¹⁰⁸ The EMA Plan describes in detail the various deposits, formations, and structures within the Plan area. The significant unconsolidated units and their aquifer assignments are as follows:

Paso Robles Formation Aquifer (includes Older Alluvium)

- Terrace Deposits / Older Alluvium (fluvial-Qoa): consists of unconsolidated to poorly consolidated sands and gravels with common silt and clay zones.
- Paso Robles Formation (Alluvial fans- QTp): consists of poorly consolidated to unconsolidated, poorly sorted, gravels, sands, silts, and clays.

Careaga Sand Aquifer

- Careaga Sand (marine-Tca): consists of massive, fine-to-coarse sand.

Bottom of Basin - The CMA defines the bottom of the Basin Plan area as the contact between the base of the water-bearing formations (includes the Paso Robles Formation and/or Careaga Sand) and the top of the Monterey Shale

¹⁰⁰ Santa Ynez River Valley Central Management Area GSP, Section 2a.5, p. 281.

¹⁰¹ Santa Ynez River Valley Central Management Area GSP, Section 2a.5-1, p. 281.

¹⁰² Santa Ynez River Valley Central Management Area GSP, Section 2a.5-2, p. 282.

¹⁰³ Santa Ynez River Valley Central Management Area GSP, Section 2a.2-2-1, p. 207.

¹⁰⁴ Santa Ynez River Valley Central Management Area GSP, Section 5a.1-2, p. 574.

¹⁰⁵ Santa Ynez River Valley Central Management Area GSP, Section 5a.2-2, pp. 576-577.

¹⁰⁶ Santa Ynez River Valley Central Management Area GSP, Section 5a.2-3, pp. 577-578.

¹⁰⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 1.2, p. 53.

¹⁰⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.4.1, p. 130.

bedrock. The aquifer extends to a maximum depth of approximately 3,500 feet in some areas.¹⁰⁹

The Plan states that in the Santa Ynez uplands, which covers the majority of the EMA, the “principal aquifers are separated from the topographically lower Santa Ynez River and associated Alluvium to the south by a ridge of low permeability rocks (e.g., Monterey Formation), except in areas where tributaries to the Santa Ynez River cut through.”¹¹⁰ The Plan notes that the Paso Robles Formation and Older Alluvium have similar hydrogeologic characteristics and were therefore combined, and are being managed, as a single principal aquifer for the purposes of the GSP.¹¹¹ The Plan provides a table that describes the physical properties of both aquifers that includes lateral and vertical extents, hydrologic conductivity, storativity, and porosity.¹¹²

The Plan states that “groundwater from both principal aquifers has many beneficial uses within the EMA including agricultural use, municipal and industrial use, domestic use, and environmental uses, particularly where groundwater is connected to surface water that supports groundwater dependent ecosystems.”¹¹³

The Plan provides nine cross-sections that depict stratigraphic and structural features in the Plan area.¹¹⁴ However, Department staff note that the cross-sections are difficult to evaluate in detail due to the limited vertical exaggeration applied when constructing the cross-sections.

The Plan identifies limited fall groundwater elevation data, fault influence on groundwater flow, well completion data, and a lack of subsidence monitoring data as data gaps for the EMA.¹¹⁵ A few of the Plan’s potential projects and management actions are associated with filling one or more of the above data gaps.¹¹⁶

While Department staff pointed out a few areas for clarification and improvements, such as the rationale for the omission of alluvium in the principal aquifers and greater detail on the cross-sections, the hydrogeologic conceptual model presented in the Plan generally complies with GSP Requirements by providing information about the Basin’s geologic structures, principal aquifers, and basin boundaries. Department staff recommend the GSAs provide additional analysis and description that more clearly delineates the physical properties of the principal aquifers and the physical relationship of the Santa Ynez River Alluvium with those principal aquifers. The analysis and description should indicate improved understanding of the hydrogeologic contact, lateral flow, and vertical flow of groundwater between the principal aquifers, the river alluvium, and various surface

¹⁰⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.4.2, pp. 131-133.

¹¹⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.1.1, p. 105.

¹¹¹ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.4.1, p. 130.

¹¹² Santa Ynez River Valley Eastern Management Area GSP, Table 3-4, p. 139.

¹¹³ Santa Ynez River Valley Eastern Management Area GSP, Section 3-1.4.7, p. 146.

¹¹⁴ Santa Ynez River Valley Eastern Management Area GSP, Figures 3-5 through 3-14, pp. 118-129.

¹¹⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 3-1.5, pp. 147-149.

¹¹⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 6-1, p. 393.

streams (including tributaries to the Santa Ynez River) across the entire Basin (see [Recommended Corrective Action 2](#)).

4.2.2 Groundwater Conditions

The GSP Regulations require a written description of historical and current groundwater conditions for each of the applicable sustainability indicators and groundwater dependent ecosystems (GDEs) that includes the following: groundwater elevation contour maps and hydrographs,¹¹⁷ a graph depicting change in groundwater storage,¹¹⁸ maps and cross-sections of the seawater intrusion front,¹¹⁹ maps of groundwater contamination sites and plumes,¹²⁰ maps depicting total subsidence,¹²¹ identification of interconnected surface water systems and an estimate of the quantity and timing of depletions of those systems,¹²² and identification of GDEs.¹²³

Western Management Area GSP

The Plan provides a total of 15 hydrographs that depict long-term groundwater elevation trends for the defined principal aquifers and one hydrograph that depicts long-term trends for the Santa Ynez River Alluvium area (classified by the GSP as “underflow”).¹²⁴ Of the 15 hydrographs, eight are representative of the Lompoc Plain subarea, one is representative of the Lompoc Terrace subarea, two are representative of the Lompoc Upland subarea, and four are representative of the Santa Rita Upland subarea. The periods of record for the hydrographs varies, but generally begin in or prior to the 1980s (with a few having records starting as early as the mid-1920s) and extending through 2022. For discussion purposes, the Plan defines “historical conditions” as groundwater conditions observed between 1924 through 2020, and “current conditions” as groundwater conditions occurring between 2015-2020.¹²⁵ The Plan notes that hydrographs representing groundwater conditions in the Upper and Lower aquifers indicate that groundwater elevations generally increased throughout the WMA during the 1990-2000 wet period and decreased during the 2005-2020 dry period.¹²⁶

The Plan states that there is significant agricultural groundwater use in the western portion of the Lompoc Plain.¹²⁷ Department staff note that representative wells in this area generally exhibit stable to slightly decreasing trends.¹²⁸ The Plan states that groundwater

¹¹⁷ 23 CCR §§ 354.16 (a)(1-2).

¹¹⁸ 23 CCR § 354.16 (b).

¹¹⁹ 23 CCR § 354.16 (c).

¹²⁰ 23 CCR § 354.16 (d).

¹²¹ 23 CCR § 354.16 (e).

¹²² 23 CCR § 354.16 (f).

¹²³ 23 CCR § 354.16 (g).

¹²⁴ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3, pp. 310-337.

¹²⁵ Santa Ynez River Valley Western Management Area GSP, Section 2B, p. 299.

¹²⁶ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3, p. 313.

¹²⁷ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3-1, p. 323.

¹²⁸ Santa Ynez River Valley Western Management Area GSP, Figures 2b.1-4B through 2b.1-4E, pp. 315-319.

in the eastern portion of the Lompoc Plain is used to meet a mix of municipal, industrial, and limited agricultural demands. The hydrograph for the only well representing the Lower Aquifer in this area (7N/34W-24N1) shows a consistent, long-term groundwater elevation decline dating back to approximately 1925.¹²⁹ The groundwater elevations in the Lompoc Terrace subarea¹³⁰ appear to have remained stable during the historical period, and the Plan states that there is no significant groundwater use in the Burton Mesa subarea (land owned by Vandenberg Space Force Base).¹³¹ The Plan notes that groundwater in the Lompoc Upland and Santa Rita Upland subareas are used for a mix of agricultural and domestic purposes. Both representative wells in the Lompoc Upland subarea, which are screened within the lower aquifer, exhibit long-term declining groundwater elevation trends over the historical period.¹³² The Lower aquifer in the Santa Rita Upland subarea has experienced a net decline in groundwater elevations of approximately 20-50 feet over the historical period, with the oldest period of record dating as far back as the 1960s.¹³³ Department staff generally agree with the GSA's assessment of groundwater levels; however, staff are concerned with the steady and significant declines in Lower Aquifer groundwater levels in the eastern Lompoc Plain, Lompoc Uplands, and Santa Rita Upland subareas. It is evident that prolonged droughts and wet periods have little to no effect on the steady declines.¹³⁴

The Plan includes a description of the change in groundwater storage and charts depicting the change in storage demonstrating the annual and cumulative change in volume of groundwater storage, with water year type (wet, normal, dry) indicated. The Plan notes that the annual and cumulative change in groundwater storage volumes are based on the annual groundwater reports produced by the Santa Ynez River Water Conservation District. The Plan states that between 1982 and 2018, the historical total estimated groundwater storage loss for the WMA was estimated to be approximately 15,000 acre-feet.¹³⁵

Moreover, to estimate the change in groundwater storage for the Lompoc Upland, Lompoc Terrace, and Santa Rita Upland subareas, the Plan indicates that the GSA used a method similar to the one used by the US Bureau of Reclamation to determine the quantity of dewatered storage beneath the forebay on the Lompoc Plain Plan area and in the Santa Ynez River alluvial deposits — in connection with the SWRCB Order No. 2019-0148. However, the Plan does not provide any actual details on the process used.¹³⁶ Department staff note that the calculated change in groundwater storage included in the

¹²⁹ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3-1, p. 324.

¹³⁰ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3-2, pp. 324-325.

¹³¹ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3-3, p. 325.

¹³² Santa Ynez River Valley Western Management Area GSP, Figures 2b.1-6A through 2b.1-6B, p. 329.

¹³³ Santa Ynez River Valley Western Management Area GSP, Section 2b.1-3-5, pp. 326, 335.

¹³⁴ Santa Ynez River Valley Western Management Area GSP, Figure 2b.1-4H, p. 321, Figure 2b.1-6B, p. 329, Figure 2b.1-7B, p. 331.

¹³⁵ Santa Ynez River Valley Western Management Area GSP, Section 2b.2-1, p. 339.

¹³⁶ Santa Ynez River Valley Western Management Area GSP, Section 2b.2-1, p. 339.

groundwater conditions section of the GSP (a net decline of approximately 15,000 acre-feet for the WMA), differs significantly from the estimated groundwater change in storage presented in the water budget section of the Plan. Both estimates utilize the same historical period (1982 to 2018); however, the water budget estimates the groundwater change in storage over the historical period to be an approximate net loss of 37,000 acre-feet for the Plan area.¹³⁷ Refer to the Section 4.2.3 ([Water Budget](#)) for additional details.

The Plan includes a description of current and historical groundwater quality issues and has identified several constituents of interest based on potential effects on the established beneficial groundwater uses in the WMA.¹³⁸ The GSA states that groundwater quality is “suitable for potable and agricultural uses.”¹³⁹

The Plan provides descriptions, tables, and maps for groundwater quality in the WMA using water quality data (collected between 2015 and 2018) for total dissolved solids (TDS), chloride, sulfate, boron, sodium, and nitrate as nitrogen. The Lompoc Plains subarea has a significant number of wells with elevated TDS (42 out of 74 wells sampled exceeded the 2019 Central Coast Basin Plan water quality objectives [WQOs]),¹⁴⁰ chloride (27 out 75 wells exceeded WQOs),¹⁴¹ and nitrate as nitrogen (31 out 75 wells exceeded WQOs).¹⁴² The Santa Ynez River area has wells with elevated levels of sulfate (15 out of 15 wells sampled exceeded WQOs)¹⁴³ and sodium (6 out of 15 wells exceeded WQOs).¹⁴⁴ The known contaminant sites and plumes within the management area are described and mapped.¹⁴⁵ The majority of plumes in the WMA are generally attributed to either leaking underground storage tank sites or the Vandenberg Space Force Base and associated launch complexes.¹⁴⁶

The Plan states that only the Upper Aquifer is hydrologically connected to the Pacific Ocean (in the Santa Ynez River estuary). The Plan notes that the Lower Aquifer is absent in the western portion of the WMA and that the Upper Aquifer is underlain by non-water bearing consolidated formations along the coast, creating a possible barrier between the ocean and the Lower Aquifer’s Paso Robles and Careaga Formations.¹⁴⁷ The GSA states that seawater intrusion is not observed, nor expected to occur in the Lower Aquifer due to the geology¹⁴⁸ and only the Upper Aquifer is hydrologically connected to the Pacific Ocean in the Santa Ynez River Estuary. The Plan presents data and figures describing

¹³⁷ Santa Ynez River Valley Western Management Area GSP, Figure 2b.3-5, p. 473, Table 2c.3-6, p. 475.

¹³⁸ Santa Ynez River Valley Western Management Area GSP, Section 2b.3-1, pp. 351-352.

¹³⁹ Santa Ynez River Valley Western Management Area GSP, Section 2b.3-2, p. 353.

¹⁴⁰ Santa Ynez River Valley Western Management Area GSP, Table 2b.3-3, p. 362.

¹⁴¹ Santa Ynez River Valley Western Management Area GSP, Table 2b.3-4, p. 367.

¹⁴² Santa Ynez River Valley Western Management Area GSP, Table 2b.3-8, p. 377.

¹⁴³ Santa Ynez River Valley Western Management Area GSP, Table 2b.3-5, p. 368.

¹⁴⁴ Santa Ynez River Valley Western Management Area GSP, Table 2b.3-7, p. 374.

¹⁴⁵ Santa Ynez River Valley Western Management Area GSP, Section 2b.3-3, pp. 355-356.

¹⁴⁶ Santa Ynez River Valley Western Management Area GSP, Figure 2b.3-2, p. 359.

¹⁴⁷ Santa Ynez River Valley Western Management Area GSP, Section 2a.2-2-2, p. 233, Section 2b.4-1-1, p. 382.

¹⁴⁸ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-4, p. 518.

the current seawater intrusion front in the Upper Aquifer.¹⁴⁹ Elevated chloride concentrations are currently observed in the estuary area (which is naturally brackish) located at the mouth the Santa Ynez River.¹⁵⁰

The Plan does not discuss historical seawater intrusion that may have occurred in the past but does provide historical monitoring sites that are located throughout the Plan area. Based on review of the SWRCB's Groundwater Ambient Monitoring and Assessment (GAMA) water quality interactive database, Department staff noted monitoring wells further inland with elevated concentrations of chloride and TDS, with measurements dating back to the 1950s. However, there was not enough consistent data to indicate that there have been prior issues with seawater intrusion.¹⁵¹

The Plan discusses data regarding land subsidence and concludes that land subsidence due to groundwater extraction has not occurred within either the current or historical conditions periods. The GSA believes that most if not all of subsidence or uplift is a result of fault movement in the tectonically active area.¹⁵²

The Plan identifies a portion of the Santa Ynez River, occurring between the Lompoc Narrows and the Pacific Ocean, as having seasonally interconnected surface water and groundwater.¹⁵³ As described in the Plan, "[d]uring periods of high flows, the groundwater levels in the Upper Aquifer are hydraulically connected to the channel thalweg in the Santa Ynez River. The reach is considered seasonally interconnected because the Santa Ynez River is dry for significant periods of time during the year...".¹⁵⁴

The Plan also includes a discussion on GDEs, with emphasis on the periodic release of water into the Santa Ynez River during steelhead spawning season mandated by SWRCB Order WR 2019-0148.¹⁵⁵ The Plan identifies other potential GDEs but concludes that the periodic water release renders these non-vulnerable.¹⁵⁶

Central Management Area GSP

The Plan provides a total of six hydrographs that depict long-term groundwater elevation trends in the CMA.¹⁵⁷ The period of record for the hydrographs varies, but generally begin in or prior to the 1980s (some dating back to as early as the mid-1940s) and extending through 2022. Like the WMA, the historical conditions period is defined as 1924 through

¹⁴⁹ Santa Ynez River Valley Western Management Area GSP, Section 2b.4-1-1, pp. 382-391.

¹⁵⁰ Santa Ynez River Valley Western Management Area GSP, Figure 2b.4-3, p. 387.

¹⁵¹ California Water Resources Control Board, GAMA Groundwater Information System, <https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/>, Accessed on November 29, 2023.

¹⁵² Santa Ynez River Valley Western Management Area GSP, Section 2b.5, pp. 397-398.

¹⁵³ Santa Ynez River Valley Western Management Area GSP, Figure 2b.6-1, p. 407.

¹⁵⁴ Santa Ynez River Valley Western Management Area GSP, Section 2b.6-1, p. 405.

¹⁵⁵ Santa Ynez River Valley Western Management Area GSP, Section 2b.6-3, pp. 415-416.

¹⁵⁶ Santa Ynez River Valley Western Management Area GSP, Section 2b.6-3, p. 417.

¹⁵⁷ Santa Ynez River Valley Central Management Area GSP, Figures 2b.1-4AB through 2b.1-5CD, pp. 299, 303, and 305.

2020, and the current conditions period is defined as 2015-2020.¹⁵⁸ The two hydrographs representing groundwater conditions in the Buellton Aquifer within the Buellton Upland subarea indicate groundwater elevations that generally increase throughout the management area during the 1990-2000 wet period and decrease throughout the management area during the 2005-2020 dry period. Department staff note that most of the Buellton Uplands subarea is without groundwater monitoring wells, thus it is impossible to sufficiently characterize the groundwater level conditions for the area.¹⁵⁹ The Plan does indicate this is a data gap that the GSA intends to fill.¹⁶⁰ Regarding the Santa Ynez River Alluvium subarea,¹⁶¹ the Plan notes that wells 6N/32W-12K1/2 and 6N/31W-7F1 are deep wells perforated in the Careaga Sand Formation that represent long-term conditions of the Buellton Aquifer (the other two wells in this subarea, 6N/32W-17J2 and 6N/31W-17D1, are attributed to Santa Ynez River underflow).¹⁶² As described in the Plan, water levels in both these wells declined 6 to 9 feet during the period 1985-1992 and then increased by 8 to 12 feet from the mid-1990s to the mid-2000s. After 2005 and 2006, water levels declined by 26 to 27 feet by the year 2016. The Plan indicates that this latest period has the largest water level decline that has been observed historically in the CMA.¹⁶³ Water levels in both wells have since recovered by 12 to 17 feet during the period from 2017 to 2020.

The Plan provides spring 2020 and fall 2019 groundwater elevation contour maps¹⁶⁴ for the CMA; however, contouring is only depicted for the Santa Ynez River Alluvium subarea due to the lack of available data in the Buellton Uplands.¹⁶⁵ Due to the data gaps in the CMA, Department staff are unable evaluate groundwater level conditions in the area and recommend the GSA expeditiously work towards filling the groundwater level data gaps in the Buellton Uplands by the next periodic evaluation.

The Plan includes a description of the change in groundwater storage and charts depicting the annual and cumulative change in volume of groundwater storage, with water year type (wet, normal, or dry) indicated. Between 1982 and 2018, the Plan states that the total estimated change in groundwater storage was a gain of approximately 900 acre-feet.¹⁶⁶

The Plan states the area is not hydrologically connected to the Pacific Ocean and that seawater intrusion is not a relevant sustainability indicator for the management area.¹⁶⁷

¹⁵⁸ Santa Ynez River Valley Central Management Area GSP, Section 2b, p. 283.

¹⁵⁹ Santa Ynez River Valley Central Management Area GSP, Section 2b.1-2, p. 287.

¹⁶⁰ Santa Ynez River Valley Central Management Area GSP, Section 2b.1-2, p. 287.

¹⁶¹ Santa Ynez River Valley Central Management Area GSP, Figure 2b.1-3, p. 297.

¹⁶² Santa Ynez River Valley Central Management Area GSP, Section 2b.1-3-2, p. 301.

¹⁶³ Santa Ynez River Valley Central Management Area GSP, Section 2b.1-3-2, p. 301, Figure 2b-5A and B, p. 303.

¹⁶⁴ Santa Ynez River Valley Central Management Area GSP, Figure 2b.1-1, p. 291.

¹⁶⁵ Santa Ynez River Valley Central Management Area GSP, Section 2b.1-2, p. 288, Figure 2b.1-3, p. 297.

¹⁶⁶ Santa Ynez River Valley Central Management Area GSP, Section 2b.2-1, p. 307.

¹⁶⁷ Santa Ynez River Valley Central Management Area GSP, Section 2b.4, p. 349.

The Plan includes a description of current and historical groundwater quality issues. The Plan identifies several constituents of interest based on potential effects on the established beneficial groundwater uses in the management area.¹⁶⁸ The Plan states that groundwater quality is generally “suitable for potable and agricultural uses.”¹⁶⁹ The Plan provides descriptions, tables, and maps for groundwater quality in the CMA using water quality data (collected between 2015 and 2018) for TDS, chloride, sulfate, boron, sodium, and nitrate as nitrogen. Only water samples from the Santa Ynez River area wells have elevated levels of sodium (nine wells exceeding WQOs out of 26 tested).¹⁷⁰ Both the Bulletin Upland and Santa Ynez River areas had elevated concentrations of nitrate as nitrogen (10 out of 13 wells and 17 out of 32 wells exceeding WQOs, respectively).¹⁷¹ The known contaminant sites and plumes within the management area are described and mapped.¹⁷²

The GSA discusses land subsidence data within the management area and concludes that land subsidence due to groundwater extraction has not occurred recently or historically. The GSA believes that most if not all of subsidence or uplift is a result of fault movement in the tectonically active area.¹⁷³

The Plan only identifies a portion of the Buellton Aquifer underling the Santa Ynez River as being potentially interconnected with surface water within the CMA.¹⁷⁴ The Plan indicates that if there is a connection between the Buellton Aquifer and the River, it would be minimal. However, the Plan states that “the extent of the Buellton Aquifer underneath the underflow deposits east of the Buellton Bend, and the quantity and timing of water flowing from the Buellton Aquifer to the underflow deposits of the Santa Ynez River and indirectly to the surface flow is a data gap.” The portion of the Santa Ynez River west of the Buellton Bend, is described as separated from the Buellton Aquifer by bedrock.¹⁷⁵ Department staff believe, based on information provided in the Plan, that there is likely some degree of interconnection between the Buellton Aquifer and the Santa Ynez River east of the Buellton Bend. Department staff recommend the GSA take the necessary steps to resolve the data gaps and confirm the locations of interconnected surface water in the CMA.

The Plan includes a discussion on GDEs within the management area. The Plan notes that habitat along the Santa Ynez River is not currently vulnerable due, in part, to the periodic release of water into the Santa Ynez River during steelhead spawning season,

¹⁶⁸ Santa Ynez River Valley Central Management Area GSP, Sections 2b.3-1 through 2b.3-2-3, pp. 319-322.

¹⁶⁹ Santa Ynez River Valley Central Management Area GSP, Section 2b.3-2, p. 321.

¹⁷⁰ Santa Ynez River Valley Central Management Area GSP, Table 2b.3-7, p. 340.

¹⁷¹ Santa Ynez River Valley Central Management Area GSP, Table 2b.3-8, p. 345.

¹⁷² Santa Ynez River Valley Central Management Area GSP, Section 2b.3-3, pp.323-324, Figure 2b.3-1, p. 325, Figure 2b.3-2, p. 327.

¹⁷³ Santa Ynez River Valley Central Management Area GSP, Section 2b.5, p. 350.

¹⁷⁴ Santa Ynez River Valley Central Management Area GSP, Figure 2b.6-3, p. 365.

¹⁷⁵ Santa Ynez River Valley Central Management Area GSP, Section 2b.6-2, p. 364.

as mandated by SWRCB Order WR 2019-0148.¹⁷⁶ However, the GSP notes that GDEs along the Santa Ynez River, may still be impacted by the lowering of groundwater levels in the Buellton Aquifer in areas where the River overlies the Buellton Aquifer (i.e., east of Buellton Bend). Additionally, the Plan acknowledges that the data gaps in the monitoring network limit the GSA's ability to evaluate GDEs — in particular for the area identified at the distal end of the Santa Rosa Creek, near the confluence with the Santa Ynez River.¹⁷⁷

Eastern Management Area GSP

The Plan provides a description of current and historical groundwater conditions. The Plan includes hydrographs for 24 representative monitoring sites.¹⁷⁸ The GSP provides groundwater level contour maps representing spring 2018 conditions for each of the two principal aquifers.¹⁷⁹ The Plan states that there is limited groundwater monitoring that has been conducted in the fall which precluded the creation of fall contour maps.¹⁸⁰ Review of the WY2022 annual report for the Basin shows that the GSA has made progress on collecting the fall measurements and created fall contour maps.¹⁸¹ In reviewing the contour map provided in the Plan for the Careaga Sand principal aquifer, Department staff noted that only the western portion of the EMA was represented. Regarding this issue, the Plan states that “[a]ll of the known groundwater wells that are completed in the Careaga Sand are located in the western portion of the EMA.”¹⁸²

The Plan provides details on groundwater in storage in Section 3.3 - Water Budget.¹⁸³ Per the water budget, between the historical period of 1982 and 2018, the change in groundwater storage was an approximate net decline of 62,100 acre-feet.¹⁸⁴ The storage loss in the Plan area is projected to continue through 2040.¹⁸⁵

The Plan area is located far from coastal areas and seawater intrusion is not a relevant sustainability indicator for the Plan area.¹⁸⁶

The Plan identifies TDS, chloride, sulfate, boron, sodium, and nitrate as N as constituents of interest for the EMA and includes a discussion on groundwater quality in the area supported by data from 1984 through 2021. The Plan states that reported TDS concentrations have ranged from 290 to 1,700 milligrams per liter (mg/L) in the EMA, with an average of 551 mg/L. The Plan notes that TDS concentrations reported in wells

¹⁷⁶ Santa Ynez River Valley Central Management Area GSP, Section 2b.6-4, p. 369.

¹⁷⁷ Santa Ynez River Valley Central Management Area GSP, Section 2b.6-4, p. 369.

¹⁷⁸ Santa Ynez River Valley Eastern Management Area GSP, Appendix D, pp. 577-603.

¹⁷⁹ Santa Ynez River Valley Eastern Management Area GSP, Figure 3-20, p. 153, Figure 3-21, p. 155.

¹⁸⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.1.1, p. 150.

¹⁸¹ California Department of Water Resources, SGMA GSP Portal, Santa Ynez River Valley Eastern Management Area Water Year 2022 Annual Report, <https://sgma.water.ca.gov/portal/gspar/preview/274>.

¹⁸² Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.1.1, p. 154.

¹⁸³ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.3, p. 161.

¹⁸⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 3.3.3.6, p. 247.

¹⁸⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 3.3.3.6, p. 247.

¹⁸⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2, p. 150.

screened within the Careaga Sand are elevated due to the formation's marine origin.¹⁸⁷ Additionally, the Plan states that elevated concentrations of boron, chloride, and sodium have been reported in wells within the CMA. The Plan describes these constituents as being "generally associated with salt-containing minerals that are naturally present in the watershed."¹⁸⁸

A description of subsidence conditions in the EMA is provided along with maps¹⁸⁹ of recent land subsidence. InSAR data, collected between 2015 to 2019, shows some vertical displacement in the EMA ranging from an elevation decrease of up to 0.07 feet to as much as 0.09 feet of uplift.¹⁹⁰ However, the minor amount of land surface elevation change appears to be relatively insignificant and likely a result of tectonic activity in the region. The GSP states that there has probably been some subsidence from groundwater pumping that occurred historically, but there are no reports of documented impacts.¹⁹¹

The Plan includes a subsidence susceptibility analysis which includes an evaluation of the potential subsidence that could occur from lowering groundwater levels below historical levels.¹⁹² Based on the analysis, two representative well locations showed an estimated total potential for subsidence of between 0.5 to 3 feet over the next 20 years. However, the plan adds that it is "unlikely that the full amount of estimated subsidence would be observed, unless groundwater elevations declined significantly below what has been observed historically and did not recover for an extended period."¹⁹³

The Plan describes the southern ends of Alamo Pintado and Zanja de Cota Creeks, at the confluence with the Santa Ynez River, as having a continuous saturated zone between surface water and the regional groundwater table and notes that groundwater discharges to surface water at these locations.¹⁹⁴

The Plan explains the Santa Ynez River is exempt from SGMA and that the water in the river-channel deposits and the Younger Alluvium downstream of Lake Cachuma and upstream of the Lompoc Narrows constitutes underflow in a relatively impermeable bed and banks.¹⁹⁵ As explained above, the legal characterization of the Santa Ynez River Alluvium area appears to be disputed between the GSAs and the SWRCB and Department staff have no expertise or authority to resolve that issue in this Plan assessment. However, regardless of that issue, the Plan fails to account for the process of groundwater discharge to the river in its evaluation of interconnected surface water.¹⁹⁶

¹⁸⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.3, p. 168.

¹⁸⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.3, p. 162.

¹⁸⁹ Santa Ynez River Valley Eastern Management Area GSP, Figures 3-32 and 3-33, pp. 181-182.

¹⁹⁰ Santa Ynez River Valley Eastern Management Area GSP, Section, 3.2.4, p. 183.

¹⁹¹ Santa Ynez River Valley Eastern Management Area GSP, Section, 3.2.4, p. 184.

¹⁹² Santa Ynez River Valley Eastern Management Area GSP, Section, 3.2.4, p. 183.

¹⁹³ Santa Ynez River Valley Eastern Management Area GSP, Section, 3.2.4, pp. 183-184.

¹⁹⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.5.1, p. 185.

¹⁹⁵ Santa Ynez River Valley Eastern Management Area GSP, Appendix K, p 1098.

¹⁹⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1, pp. 102-103.

As described in the Plan “discharge from the Paso Robles Formation occurs either as surface water or groundwater flow from the alluvium present in the tributaries to the Santa Ynez River. Very small quantities of groundwater flow may occur through fractures in the bedrock in consolidated rocks in the Ballard Canyon area and maybe less than 100 AFY. Surface water also discharges from the EMA as groundwater flow from the Santa Ynez River alluvium that crosses into the CMA.”¹⁹⁷ The Plan does not identify the quantity or location of depletions. Department staff conclude that the GSA should consider the interconnectivity of the surrounding Plan area and the Santa Ynez River by clearly identifying the locations of groundwater discharge and those areas groundwater discharge that may be impacted by groundwater pumping.

The Plan describes the process used for identifying GDEs within the Plan area. After mapping the potential GDEs in the Plan area using the Department’s Natural Communities data set,¹⁹⁸ the GSA used the process developed by The Nature Conservancy¹⁹⁹ to map and characterize the GDEs.²⁰⁰ The GSA then used greater than 30 feet to groundwater to filter out data that most likely were not GDEs.²⁰¹ The GSA then created two categories of GDEs – (A) those GDEs associated with a principal aquifer and are potentially affected by groundwater management activities, and (B) those GDEs that are unlikely to be affected by pumping and groundwater management activities.²⁰² The result shows the majority of the GDEs are located along the various tributaries to the Santa Ynez River in the Plan area.²⁰³ Additionally, the Plan includes the mapping of Special-Status Species and their ecosystem conditions.²⁰⁴

This staff report identified several areas that the GSAs need to improve such as monitoring data gaps in the Buellton Aquifer, preparing seasonal low assessments (contours) and further assessing groundwater interconnection with surface water. Aside from these areas of needed improvement, the Plan adequately describe the Basin’s historical and current groundwater conditions. Department staff conclude that the Plan substantially complies with the groundwater conditions requirements outlined in the GSP Regulations.

¹⁹⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.4.5, p. 143.

¹⁹⁸ Santa Ynez River Valley Eastern Management Area GSP, Figure 3-36, p. 194.

¹⁹⁹ Rohde, M.M., S. Matsumoto, J. Howard, S. Liu, L. Riege, and E.J. Remson. 2018. Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans. Published by The Nature Conservancy. San Francisco, California. Available at <https://groundwaterresourcehub.org/sgma-tools/gsp-guidance-document/>.

²⁰⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.6.1, p. 189.

²⁰¹ Santa Ynez River Valley Eastern Management Area GSP, Figure 3-37, p. 195, Figure 3-38, p. 196.

²⁰² Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.6.1, p.197.

²⁰³ Santa Ynez River Valley Eastern Management Area GSP, Figure 3-39, p. 198.

²⁰⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2.6.3, p. 201, Figures 3-40 to 3-42, pp. 202-204.

4.2.3 Water Budget

GSP Regulations require a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical; current; and projected water budget conditions,²⁰⁵ and the sustainable yield.²⁰⁶

To develop its water budgets, the Western Management Area and the Central Management Area coordinated the development of a common numerical model referred to as WMA/CMA Model.²⁰⁷ The Eastern Management Area developed its own numerical model referred to as Santa Ynez Eastern Management Area Hydrologic Model. In both cases MODFLOW-USG was used. The three Plans coordinated the water budgets for the Basin, relying on common assumptions and sources of data such as precipitation and streamflow data; groundwater level data; State Water Project and Cachuma Project deliveries, diversions and use of Santa Ynez River water; groundwater flux between management areas; and base periods.²⁰⁸ Per the coordination agreement, each GSP uses the same three water year periods of analysis to assess historical (1982-2018), current (2011-2018), and projected (2018-2072) water budget conditions.²⁰⁹

The Plans provides historical water budgets for the period spanning from water year 1982 to water year 2018. The historical period includes two major droughts, 1985-1991 and 2012-2018.²¹⁰ A water year type was assigned to each year based on precipitation data.²¹¹ The historical water budget information is provided in tabular and graphical forms in each of the three Plans.

Department staff reviewed inflows and outflows for surface water and groundwater to evaluate the level of coordination that occurred between each of the management areas when establishing the historical water budgets. When comparing surface water outflows from the EMA with inflows to WMA, Department staff noted that surface water increased by approximately 6,000 AFY. Groundwater inflows and outflows are somewhat similar between the Plans. Department staff conclude that even though there is general agreement between the three management areas historical water budgets, there is still room for improvement by further refining the outflows and inflows between the management areas.

²⁰⁵ 23 CCR §§ 354.18 (a), 354.18 (c) *et seq.*

²⁰⁶ 23 CCR § 354.18 (b)(7).

²⁰⁷ Santa Ynez River Valley Western Management Area GSP, Appendix 2c-A, Section 1.0, p. 1029; Santa Ynez River Valley Eastern Management Area GSP, Appendix 2c-A, Section 1.0, p. 923.

²⁰⁸ California Department of Water Resources, SGMA Portal, "Santa Ynez River Valley Groundwater Basin Coordination Agreement", <https://sgma.water.ca.gov/portal/service/gspdocument/download/6013>.

²⁰⁹ Santa Ynez River Valley Basin Coordination Agreement, California Department of Water Resources SGMA Portal, <https://sgma.water.ca.gov/portal/service/gspdocument/download/6013>.

²¹⁰ Santa Ynez River Valley Western Management Area GSP, Figure 2c.1-2, p. 430.

²¹¹ Santa Ynez River Valley Western Management Area GSP, Table 2c.1-1, p. 429.

The reported historical change in groundwater storage for WMA was a decrease of 36,734 acre-feet,²¹² CMA reported 60 acre-feet increase,²¹³ and EMA reported a decrease of 62,110 acre-feet.²¹⁴ This has resulted in an estimated overall groundwater storage deficit of 98,784 acre-feet for the Basin for the years 1982 to 2018. Department staff believe that data gaps related to the lack of groundwater level data in CMA's Buellton Aquifer may refine the estimate of historic groundwater storage change. Refer to the Section 4.2.2 ([Groundwater Conditions](#)) and Section 4.4 ([Monitoring Network](#)) for more information on the issue.

The Plans include a current water budget using water years 2011-2018.²¹⁵ This 8-year period includes the most recent hydrology, water supply, water demand, and land use information. Current conditions are considered very dry but includes 2011 which was a wet year. This period is part of the historical period (1982-2018), and hence, all the abovementioned statements about the historical water budget are true for the current water budget as well.

The reported change in groundwater storage during the current period for WMA was a decrease of 45,541 acre-feet,²¹⁶ CMA reported a decrease of 11,004 acre-feet,²¹⁷ and EMA reported a decrease of 53,100 acre-feet.²¹⁸ This has resulted in an overall groundwater storage deficit of 109,645 acre-feet for the Basin during the years 2011 to 2018. Most of the groundwater storage deficit for the Basin has occurred over the last eight years. During the years 1982-2010 there was an estimated 10,861 acre-feet increase in groundwater storage for the Basin.

The projected water budget in the Plan is estimated and evaluated using estimated future population forecasts and projected climatic conditions provided by DWR for the period 2030 through 2072.²¹⁹ Groundwater supplies are projected to be about the same under projected conditions, while overall groundwater demand (pumping) is projected to increase slightly because of a combination of increased temperatures due to climate change and anticipated population growth. As a result, the average annual change in

²¹² Santa Ynez River Valley Western Management Area GSP, Table 2c.3-6, p. 475.

²¹³ Santa Ynez River Valley Central Management Area GSP, Table 2c.3-6, p. 425.

²¹⁴ Santa Ynez River Valley Eastern Management Area GSP, Table 3-27, p. 244.

²¹⁵ Santa Ynez River Valley Western Management Area GSP, Section 2c.4, p. 489; Santa Ynez River Valley Central Management Area GSP, Section 2c.4, p. 429; Santa Ynez River Valley Eastern Management Area GSP, Section 3.3.3, p. 235.

²¹⁶ Santa Ynez River Valley Western Management Area GSP, Table 2c.3-6, p. 475.

²¹⁷ Santa Ynez River Valley Central Management Area GSP, Table 2c.3-6, p. 425.

²¹⁸ Santa Ynez River Valley Eastern Management Area GSP, Table 3-27, p. 244.

²¹⁹ Santa Ynez River Valley Western Management Area GSP, Section 2c.5-1, p. 489; Santa Ynez River Valley Central Management Area GSP, Section 2c.5-1, p. 438; Santa Ynez River Valley Eastern Management Area GSP, Section 3.3.5.1, pp. 256-257.

storage for the Basin is forecasted to be -4,810 AFY under the Plan's 2042 climate change scenario and -6,042 AFY under the 2072 climate change scenario.²²⁰

Department staff noted a discrepancy between the estimated change in storage reported in the WMA Plan's groundwater conditions section and the WMA Plan's water budget section. Both estimates were applied over the period from 1982 to 2018. However, while approximately 15,000 acre-feet of decline is reported in the groundwater conditions section, the water budget inconsistently estimates the change in storage to be approximately 37,000 acre-feet of decline for the Plan area.²²¹ Department staff are unable to determine which of these two estimates should be used to assess the conditions in the Plan area and the Basin. Department staff encourage the GSA to review their data and reconcile these differing estimates of change in storage.

The sustainable yield (referred to as "perennial yield" in the WMA and CMA) has been defined for each of the management areas. It is calculated by the GSAs as the estimated historical average annual pumping plus the average annual change in storage (which was negative for the WMA and EMA). For the WMA the sustainable yield is 26,280 AFY,²²² the CMA sustainable yield is approximately 2,800 AFY,²²³ and the EMA sustainable yield is 12,870 AFY.²²⁴ This represents a total sustainable yield for the Basin of 41,950 AFY. Additionally, Department staff note that the WMA used the years 2002-2011 to calculate its sustainable yield while CMA and EMA used 1982-2018. This demonstrates a lack of coordination and consistency in preparing water budgets and sustainable yield estimates for the Basin.

The sustainable yield presented in the three Plans appears to be a simple accounting and reconciling of water inputs and outputs (e.g., pumping) in the Basin. This methodology does not consider the potential impacts and undesirable results to be avoided when managing the Basin. The distinction is important because SGMA's definition of sustainable yield in a basin is directly tied to undesirable results. As established in SGMA, sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in a basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.²²⁵ While the Plan's current water budgets show recent "deficits" in groundwater storage that appear likely to continue into the future, based on projected conditions, the GSAs claim that their respective management areas are not in a state of overdraft. Department staff question this assertion as the basin has experienced declining

²²⁰ Santa Ynez River Valley Western Management Area GSP, Table 2c.5-3, p. 497; Santa Ynez River Valley Central Management Area GSP, Table 2c.5-3, p. 449; Santa Ynez River Valley Eastern Management Area GSP, Table 3-38, p. 266.

²²¹ Santa Ynez River Valley Western Management Area GSP, Section 2b.2-1, p. 339, Figure 2b.3-5, p. 473, Table 2c.3-6, p. 475.

²²² Santa Ynez River Valley Western Management Area GSP, Table 2c.3-8, p. 478.

²²³ Santa Ynez River Valley Central Management Area GSP, Section 2c.3-3, p. 427.

²²⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 3.3.3.6, p. 247.

²²⁵ Water Code § 10721(w).

groundwater levels. Department staff recommend the GSAs revise the Basin's sustainable yield as the maximum quantity of water, calculated over a base period representative of long-term conditions in the Subbasin and including any temporary surplus, that can be withdrawn annually without causing undesirable results in the Subbasin.²²⁶ Department staff recommend that the GSAs collaboratively and consistently assess the Basin's hydrologic conditions, groundwater inflows and outflows, associated data gaps, and projected GSA management actions to continue to improve and refine the water budgets – including any groundwater deficits or overdraft – for the Basin as a whole, and not just the individual management areas (see [Recommended Corrective Action 3](#)).

Despite the inclusion of a recommended corrective action regarding the changes in storage and sustainable yield for the Basin, Department staff conclude the historical, current, and projected water budgets included in the Plan substantially comply with the requirements of the GSP Regulations. The GSPs provides the required historical, current, and future accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the management area and projected future water demands.

4.2.4 Management Areas

The GSP Regulations provide the option for one or more management areas to be defined within a basin if the GSA has determined that the creation of the management areas will facilitate implementation of the Plan. Management areas may employ different minimum thresholds and be operated to different measurable objectives, provided that undesirable results are defined consistently throughout the basin.²²⁷

On May 23, 2016, the Santa Ynez River Valley Groundwater Basin public water agencies executed a Memorandum of Understanding (MOU) which organized the Basin according to three separate management areas, creating the Western Management Area, Central Management Area, and Eastern Management Area.²²⁸

4.3 SUSTAINABLE MANAGEMENT CRITERIA

GSP Regulations require each Plan to include a sustainability goal for the basin and to characterize and establish undesirable results, minimum thresholds, and measurable objectives for each applicable sustainability indicator, as appropriate. The GSP Regulations require each Plan to define conditions that constitute sustainable groundwater management for the basin including the process by which the GSA

²²⁶ Water Code § 10721(w).

²²⁷ 23 CCR § 354.20.

²²⁸ Santa Ynez River Valley Western Management Area, Section 1b.1, p. 77; Santa Ynez River Valley Central Management Area, Section 1b.1, p. 72; Santa Ynez River Valley Eastern Management Area, Section 2.1, p. 57.

characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.²²⁹

4.3.1 Sustainability Goal

GSP Regulations require that GSAs establish a sustainability goal for the basin. The sustainability goal should be based on information provided in the GSP's basin setting and should include an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation.²³⁰

The three GSAs established a coordinated sustainability goal for the Basin "to sustainably manage the groundwater resources in the Western, Central, and Eastern Management Areas to ensure that the Basin is operated within its sustainable yield for the protection of reasonable and beneficial uses and users of groundwater."²³¹ The Plan also states that the absence of undesirable results will be indicative of the sustainability goal being achieved. The Plan states that the GSAs will apply an adaptive management approach regarding proposed projects and management actions to avoid undesirable results.

According to the Plan, the Basin intends to achieve the sustainability goal by ensuring:

- Long-term groundwater elevations are adequate to support existing and future reasonable and beneficial uses throughout the Basin,
- A sufficient volume of groundwater storage remains available during drought conditions and recovers during wet conditions,
- Groundwater production and projects & management actions undertaken through SGMA do not degrade water quality conditions in order to support ongoing reasonable and beneficial uses of groundwater for agricultural, municipal, domestic, industrial, and environmental purposes.

The Plan sufficiently describes the sustainability goal and the information included in the Plan substantially complies with the requirements outlined in the GSP Regulations.

4.3.2 Sustainability Indicators

Sustainability indicators are defined as any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results.²³² Sustainability indicators thus correspond with the six undesirable results: (1) chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon, (2) significant and unreasonable reduction of groundwater storage, (3) significant and unreasonable seawater intrusion, (4) significant and unreasonable degraded water

²²⁹ 23 CCR § 354.22 *et seq.*

²³⁰ 23 CCR § 354.24.

²³¹ Santa Ynez River Valley Western Management Area GSP, Section 3b.1, p. 547; Santa Ynez River Valley Central Management Area GSP, Section 3b.1, p. 484; Santa Ynez River Valley Eastern Management Area GSP, Section 5.2, p. 327.

²³² 23 CCR § 351(ah).

quality, including the migration of contaminant plumes that impair water supplies, (5) land subsidence that substantially interferes with surface land uses, and (6) depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.²³³ Sustainability indicators refer to groundwater conditions that are not, in and of themselves, significant and unreasonable. Rather, sustainability indicators refer to the effects caused by changing groundwater conditions that are monitored, and for which criteria in the form of minimum thresholds are established by the agency to define when these effects become significant and unreasonable, constituting an undesirable result.

GSP Regulations require that GSAs provide descriptions of undesirable results including defining what are significant and unreasonable potential effects to beneficial uses and users for each sustainability indicator.²³⁴ GSP Regulations also require GSPs provide the criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.²³⁵

GSP Regulations require that the description of minimum thresholds include the information and criteria relied upon to establish and justify the minimum threshold for each sustainability indicator.²³⁶ GSAs are required to describe how conditions at minimum thresholds may affect beneficial uses and users,²³⁷ and the relationship between the minimum thresholds for each sustainability indicator, including an explanation for how the GSA has determined conditions at each minimum threshold will avoid causing undesirable results for other sustainability indicators.²³⁸

GSP Regulations require that GSPs include a description of the criteria used to select measurable objectives, including interim milestones, to achieve the sustainability goal within 20 years.²³⁹ GSP Regulations also require that the measurable objectives be established based on the same metrics and monitoring sites as those used to define minimum thresholds.²⁴⁰

The following subsections consolidate these three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information, as presented in the Plan, pertaining to the processes and criteria relied upon to define undesirable results applicable to the basin, as quantified through the establishment of minimum thresholds, are addressed for each applicable sustainability

²³³ Water Code § 10721(x).

²³⁴ 23 CCR §§ 354.26 (a), 354.26 (b)(c).

²³⁵ 23 CCR § 354.26 (b)(2).

²³⁶ 23 CCR § 354.28 (b)(1).

²³⁷ 23 CCR § 354.28 (b)(4).

²³⁸ 23 CCR § 354.28 (b)(2).

²³⁹ 23 CCR § 354.30 (a).

²⁴⁰ 23 CCR § 354.30 (b).

indicator. A submitting agency is not required to establish criteria for undesirable results that the agency can demonstrate are not present and are not likely to occur in a basin.²⁴¹

4.3.2.1 Chronic Lowering of Groundwater Levels

In addition to components identified in 23 CCR §§ 354.28 (a-b), for the chronic lowering of groundwater, the GSP Regulations require the minimum threshold for chronic lowering of groundwater levels to be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results that is supported by information about groundwater elevation conditions and potential effects on other sustainability indicators.²⁴²

Western Management Area (WMA) GSP

The WMA GSP states an undesirable result would occur when groundwater levels in more than 50% of the representative monitoring wells in either the Upper or Lower Aquifer exceed their specific minimum threshold over two consecutive spring measurements during non-drought years.²⁴³ For the purpose of this definition, the WMA GSP states that “drought years” are classified as two or more consecutive years that are “Dry” or “Critically Dry” — based on the method for water year type characterization described in the Plan.²⁴⁴ The Plan explains that the requirement of the non-drought year criterion was established to avoid drought-related groundwater declines, better confirming groundwater level declines are attributed to extractions within the management area. The Plan states that utilizing 50% of the representative monitoring wells in determining the occurrence of an undesirable result allows the GSA to focus on regional groundwater levels compared to localized groundwater levels.

The GSP establishes minimum thresholds for the chronic lowering of groundwater levels at 26 representative monitoring wells. The GSP explains that the minimum threshold set at each representative monitoring well was selected based on the following factors:

- Minimum thresholds will be established at groundwater elevations that limit impacts on existing groundwater well screen intervals, and
- Minimum thresholds should not be greater than 20-feet below Basin-wide historically low water levels²⁴⁵

The WMA GSP states that historical low groundwater elevations were 40 and 20 feet below current elevations in the Upper and Lower Aquifers, respectively. The Plan notes that, based on available “well activity data,” groundwater supply has remained relatively stable since the 1980s and, therefore, the Plan concludes that historical low conditions did not create an unreasonable depletion of supply for domestic, municipal, and

²⁴¹ 23 CCR § 354.26 (d).

²⁴² 23 CCR § 354.28(c)(1) *et seq.*

²⁴³ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 552.

²⁴⁴ Santa Ynez River Valley Western Management Area GSP, Section 2b.2-2, p. 340.

²⁴⁵ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 581.

agricultural beneficial users. Additionally, the Plan states that available chloride data (corresponding to historical low conditions) indicates that unreasonable seawater intrusion did not occur, nor is it believed that these conditions significantly impacted GDEs.²⁴⁶

The GSA conducted a well impact analysis to evaluate potential impacts of groundwater elevation declines on beneficial uses and users of groundwater. The well impact analysis evaluated 2020 groundwater elevations and the top of well screens within the Upper and Lower Aquifers. The well impact analysis concluded that 2020 groundwater elevations were equal to or below the top of well screens in 34% of domestic wells, 21% of municipal wells, and 25% of agricultural wells in the Lower Aquifer. In the Upper Aquifer, 2020 groundwater elevations were at or below the top of well screens in 10% of domestic wells, 15% of municipal wells, and 2% of agricultural wells.²⁴⁷

Based on the result of the well impact analysis, the WMA GSP established minimum thresholds at 10 and 20 feet below 2020 groundwater elevations in the Upper and Lower Aquifers, respectively.²⁴⁸ The WMA GSP established separate minimum thresholds for representative monitoring wells located in the western portion of the management area, where wells in the Upper Aquifer would induce seawater intrusion if set 10 feet below 2020 groundwater levels. Minimum thresholds at these locations were set equal to mean sea level to prevent undesirable results associated with seawater intrusion. The GSP explains that the minimum thresholds for the Lower Aquifer were selected because groundwater levels within 20-feet of 2020 elevations would limit impacts to less than 40% of domestic wells and maintain groundwater elevations close to historical water levels to avoid unreasonable impacts to beneficial uses and users. The Plan states that the minimum thresholds for the Upper Aquifer were selected to be more conservative than those in the Lower Aquifer because “municipal wells are more sensitive to water level decline in the Upper Aquifer.”²⁴⁹

The GSP establishes “trigger points” for each monitoring location as a preemptive warning that groundwater elevations are approaching minimum thresholds. One trigger point would activate when groundwater elevations are observed at 5 feet above the minimum threshold in 50% of representative monitoring wells over one year. Another trigger point would activate when municipal water supplies are impacted by greater than a 20% reduction in total well pumping capacity. The WMA GSP states that if the trigger point conditions were to occur, the GSA would implement early management actions such as requesting additional releases of water from the Cachuma Reservoir that the GSA has rights to.²⁵⁰

²⁴⁶ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 584.

²⁴⁷ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 584.

²⁴⁸ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-1, p. 589.

²⁴⁹ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-1, p. 589.

²⁵⁰ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-1-1, p. 590.

The WMA GSP discusses the impacts of the minimum thresholds on the other sustainability indicators, such as groundwater storage, seawater intrusion, water quality, land subsidence, and interconnected surface water. By establishing minimum thresholds near historically low groundwater elevations, the WMA GSP intends to minimize the potential for undesirable results for the other sustainability indicators.²⁵¹

The WMA GSP defines measurable objectives for the representative monitoring wells as the spring 2011 groundwater elevations. According to the Plan, “spring 2011 preceded recent drought conditions and followed a ten-year period of near normal climate.” In the Upper Aquifer, measurable objectives are approximately 5 to 10 feet lower than historically high groundwater elevations and generally correlate to current (i.e., 2020) groundwater levels. In the Lower Aquifer, measurable objectives are at 5 to 10 feet above current groundwater levels.²⁵²

Central Management Area (CMA) GSP

The CMA GSP states an undesirable result would occur when groundwater levels in more than 50% of the representative monitoring wells exceed their specific minimum threshold over two consecutive spring measurements during non-drought years.²⁵³ For the purpose of this definition, the GSP states that “drought years” are classified as two or more consecutive years that are “Dry” or “Critically Dry” — based on the method for water year type characterization described in the Plan. The Plan explains that utilizing 50% of the representative monitoring wells in determining the occurrence of an undesirable result allows the GSA to focus on regional groundwater levels compared to localized groundwater levels. The GSP states that the requirement of two consecutive non-drought year measurements was established to avoid drought-related groundwater declines and instead identify and focus on groundwater level declines caused by extractions within the management area.

The CMA GSP describes potential effects of undesirable results for chronic lowering of groundwater levels as significantly and unreasonably reducing the total volume of groundwater storage, thus eliminating or reducing the ability of production wells to economically access groundwater or causing disconnections between interconnected surface water bodies that sustain GDEs. If undesirable results were to occur, the CMA GSP states that the potential effects to beneficial uses and users, such as agricultural; municipal; and domestic supply wells, includes risk of pump failure.²⁵⁴

The GSP defines minimum thresholds for the chronic lowering of groundwater levels at four representative monitoring wells. The GSP explains that the minimum thresholds were selected to achieve the following:

²⁵¹ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 589.

²⁵² Santa Ynez River Valley Western Management Area GSP, Section 3b.4-1, p. 597.

²⁵³ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-1, p. 497.

²⁵⁴ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-1, p. 497.

- Protect municipal, agricultural, and domestic groundwater users and supply,
- Prevent potential land subsidence,
- Maintain 2015 levels of water quality and surface water-groundwater connection along the Santa Ynez River.

Minimum thresholds set at each representative monitoring well were selected based on two components:

- Minimum thresholds will be established at groundwater elevations that limit impacts on existing groundwater well screen intervals, and
- Minimum thresholds should not be lower than 15-feet below Basin-wide 2020 water levels, which the GSP describes as within historical low groundwater conditions.²⁵⁵

The CMA GSA conducted a well impact analysis to evaluate potential impacts of groundwater elevation declines on beneficial uses and users of groundwater. The well impact analysis evaluated groundwater elevations 15 feet below the current (i.e., 2020) groundwater levels in comparison to the top of well screens. Based on the well impact analysis the CMA GSP concluded that “15 feet below 2020 groundwater elevations is the level at which 30 percent of domestic and municipal wells would begin to entrain air into the screens.” The CMA GSP also estimates that 10% of agricultural wells would be impacted at 15 feet below the 2020 groundwater levels.²⁵⁶

As a result, the CMA GSP established minimum thresholds at 15 feet below 2020 groundwater levels which, as mentioned, are near historical lows. The CMA GSP further states that undesirable results were not occurring when the groundwater levels reached historical lows (i.e., 15 to 20 feet below 2020 groundwater levels).²⁵⁷ The CMA GSP identifies data gaps in the Buellton Upland subarea and proposes to add two additional representative monitoring wells.²⁵⁸

The CMA GSP establishes “trigger points” for each monitoring location as a preemptive warning that groundwater elevations are approaching minimum thresholds. The trigger point is set at 5 feet above the minimum threshold and a management response is activated when water levels reach the trigger point in half of the representative monitoring wells over a one-year period. Another trigger point would also be activated when municipal water supplies are impacted by more than a 20% reduction in total well pumping capacity. The GSP states that if the trigger point conditions were to occur the GSA would implement early management actions such as requesting additional releases of water from the Cachuma Reservoir that the GSA has rights to.²⁵⁹

²⁵⁵ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-1, p. 518.

²⁵⁶ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-1, p. 518.

²⁵⁷ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-1, p. 518.

²⁵⁸ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-1, p. 519.

²⁵⁹ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-1, pp. 519-520.

The CMA GSP discusses the impacts of the minimum thresholds on the other sustainability indicators, such as groundwater storage, seawater intrusion, water quality, land subsidence, and interconnected surface water.²⁶⁰ The Plan states that there are no neighboring groundwater basins bordering the management area that could be impacted by the minimum thresholds. Although, the Plan does acknowledge subsurface flow between the management area and the Western and Eastern management areas.

The GSP defines measurable objectives for the chronic lowering of groundwater levels as the spring 2011 groundwater elevations (which represent historically high to near historically high groundwater levels in the Buellton Aquifer). The GSP notes the measurable objectives are achieved when half of the representative monitoring wells reach these levels.²⁶¹

Eastern Management Area (EMA) GSP

The sustainable management criteria for the chronic lowering of groundwater levels were developed with the goal of maintaining groundwater levels that continue to support current ongoing beneficial uses and users in the management area.

The GSP defines undesirable results as when either of the following scenarios occurs:

- Groundwater levels in either principal aquifer remain below minimum thresholds after two consecutive years of average and above-average precipitation in 50% of representative monitoring sites, and
- Existing agricultural, municipal, and domestic wells are unable to produce the estimated sustainable yield of the management area due to chronic groundwater level decline caused by groundwater conditions occurring throughout the management area.²⁶²

The GSP states that significant or unreasonable effects associated with groundwater decline have not occurred in the management area based on groundwater users' input and assessment of available water level data; however, the GSP acknowledges that if groundwater extraction rates continue at historic rates and dry conditions persist, undesirable results may occur in the future. The GSP explains that potential causes of undesirable results for chronic lowering of groundwater levels are extended periods of drought and elevated rates of extraction from the management area's principal aquifers.²⁶³

The EMA GSP explains that the minimum thresholds were established while considering the following guiding principles:

- Thresholds should be adaptive to observed conditions,

²⁶⁰ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-1, pp. 518-519.

²⁶¹ Santa Ynez River Valley Central Management Area GSP, Section 3b.4-1, p. 525.

²⁶² Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.1, p. 336.

²⁶³ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.1, pp. 335-336.

- Learn from other basins' GSPs that have significant groundwater issues and what must be avoided,
- Utilize the same minimum thresholds for all well types,
- Protect the most vulnerable beneficial uses and users,
- The historic and projected deficit in groundwater storage,
- Potential impacts to domestic, municipal, and agricultural wells if groundwater levels continue to decline, and
- Potential for depletion of interconnected surface water and impacts to GDEs.²⁶⁴

The EMA GSA conducted a well impact analysis to identify undesirable results and establish minimum thresholds for groundwater levels. The well impact analysis evaluated spring 2018 groundwater elevations and compared them to the top of well screen elevations for 487 agricultural, municipal, and domestic wells. The well impact analysis utilized spring 2018 data because this period contained the greatest amount of available data. The GSP states that groundwater levels that fall below the top of the screen are indicative of a significant and unreasonable depletion of supply. The well impact analysis concluded that spring 2018 groundwater elevations were below the top of well screens in approximately 28% of domestic wells and 34% of agricultural wells in the Paso Robles Formation aquifer (and no municipal wells screens were above these elevations). Spring 2018 groundwater elevations were below the top of well screens in 35% of domestic wells, 17% of municipal wells, and 28% of agricultural wells in the Careaga Sand aquifer.²⁶⁵

Based on the result of the well impact analysis, the GSP established minimum thresholds in the Paso Robles Formation aquifer and Careaga Sand aquifer as 15 feet²⁶⁶ and 12 feet²⁶⁷ below spring 2018 groundwater levels, respectively. The GSP states minimum thresholds in either aquifer are not expected to cause a significant and unreasonable depletion of supply to beneficial uses and users or cause a significant and unreasonable reduction of groundwater in storage.

The EMA GSP discusses the impacts of the minimum thresholds on the other sustainability indicators, such as water quality, land subsidence, and interconnected surface water.²⁶⁸ The EMA GSP also discusses the impacts of the minimum thresholds for chronic lowering of groundwater on other management areas and basins in the vicinity of the management area. The EMA GSP states that flow between the neighboring San Antonio Creek Groundwater Basin and the EMA is limited due to observed groundwater gradients, thus the minimum thresholds in the EMA are not anticipated to affect the neighboring basin. However, Department staff note that groundwater monitoring along this basin boundary is a data gap and, therefore, believe that additional information is likely needed to determine if the following statement is true. The EMA GSP acknowledges

²⁶⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2, pp. 337-338.

²⁶⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2, pp. 338-339.

²⁶⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2.1, p. 343.

²⁶⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2.2, p. 343.

²⁶⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2.3, pp. 343-345.

subsurface interactions between the management area and downgradient Central Management Area through the Careaga Sand aquifer and that minimum thresholds could reduce groundwater flow into the Central Management Area. However, the EMA GSP does not anticipate the minimum thresholds will cause significant and unreasonable impacts to the Central Management Area because the combined groundwater and surface water outflow was less than 2,000 AFY.²⁶⁹ The EMA GSP states that outflow to the Central Management Area is negligible in relation to annual variations of groundwater extraction rates and climate-driven variations that contribute to the Central Management Area's water budget.

The EMA GSP defines measurable objectives for the chronic lowering of groundwater levels as the average groundwater elevations measured at each representative monitoring well prior to the last drought beginning in water year 2012. The measurable objectives were established to ensure that there is enough groundwater in storage to get through a multi-year drought (as was observed from water years 2012 to 2021 with two wet years in water year 2017 and 2019) without undesirable results.²⁷⁰

The EMA GSP states that the interim milestones are based on the observed declines in groundwater elevations and groundwater storage deficit that resulted from the latest drought event. The interim milestones were established to ensure that the GSA is projected to eliminate the groundwater storage deficit as it implements the Plan. Interim milestones vary depending on the representative monitoring well, however, show a general increase in groundwater elevation during each 5-year increment.²⁷¹

The Plans excludes dry and critically dry years in the definition of undesirable results even though the Plan recognizes undesirable results due to chronic lowering of groundwater levels may occur if groundwater pumping exceeds the sustainable yield regardless of water year type.²⁷² Department staff note that SGMA includes a provision which states, "overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods."²⁷³ If the GSAs intend to incorporate this concept into their definition of the undesirable result for chronic lowering of groundwater levels, the GSPs must identify specific extraction and groundwater recharge management actions the GSAs would implement or otherwise describe how the Basin would be managed to offset – by increases in groundwater levels or storage during

²⁶⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2.4, p. 345.

²⁷⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.3, p. 348.

²⁷¹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.4, pp. 348-349, Table 5-2, pp. 350-351.

²⁷² Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 551; Santa Ynez River Valley Central Management Area GSP, Section 3b.2-1, p. 488; Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.1, p. 336.

²⁷³ Water Code § 10721(x)(1).

non-drought periods – dry year reductions of groundwater storage.²⁷⁴ The GSPs identify potential management actions and projects that, once implemented, may lead to the elimination of long-term overdraft conditions in the Basin. However, the GSPs state that only a select number of management actions described as “General Management PMAs”²⁷⁵ or “basic GSP implementation requirements”²⁷⁶ will be immediately implemented. The Plans do not provide sufficient detail on how these projects and management actions, in conjunction with the proposed chronic lowering of groundwater levels sustainable management criteria, will offset drought-related groundwater reductions and avoid significant and unreasonable impacts when groundwater level minimum thresholds are potentially exceeded for an extended period in the absence of two consecutive non-dry years. Department staff recommend the GSAs revise their definition of undesirable results to include all water year types and further evaluate how the proposed projects and management actions may offset any potential overdraft conditions (see [Recommended Corrective Action 4a](#)).

In addition to the non-drought year criteria, the quantitative definition of undesirable results for chronic lowering of groundwater levels in the WMA GSP and the CMA GSP includes the criteria that two consecutive spring measurements must exceed the minimum threshold to qualify as an undesirable result. The GSPs do not explain why spring measurements – presumably the seasonal high-water level – are applied to the undesirable result definition rather than fall measurements or the seasonal low water level. The use of spring measurements in the quantitative criteria conflicts with the GSPs stating that undesirable results associated with groundwater levels will be defined by analyzing semi-annual (i.e., spring and fall) groundwater elevation measurements.²⁷⁷ In the EMA GSP, the minimum thresholds are established based on comparing spring 2018 water level measurements to well infrastructure in the management area.²⁷⁸ However, the EMA GSP does not discuss how fall or seasonal low groundwater level conditions relate to the well infrastructure or the established minimum thresholds. In the WMA GSP and the CMA GSP, the minimum thresholds are established relative to “current 2020 levels” with no reference to the seasonal measurements. Department staff recommend the GSAs revise the sustainable management criteria to be based on seasonal low groundwater levels to ensure potential impacts to beneficial uses and users are considered (see [Recommended Corrective Action 4b](#)).

Each GSP conducted a well impact analysis to determine where to establish the minimum thresholds for groundwater levels and how those groundwater levels may impact beneficial uses and users. The well impact analyses compared “current 2020 levels” or

²⁷⁴ 23 CCR § 354.44 (b)(9).

²⁷⁵ Santa Ynez River Valley Western Management Area GSP, Section 4a, p. 610; Santa Ynez River Valley Central Management Area GSP, Section 4a, p. 534.

²⁷⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 6.2, p. 397.

²⁷⁷ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 552; Santa Ynez River Valley Central Management Area GSP, Section 3b.2-1, p. 497.

²⁷⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2, p. 338.

the spring 2018 water levels to available well infrastructure. As documented in the Plans and discussed above, the well impact analyses predicted various percentages of agricultural wells, municipal wells, and domestic wells that would have their “performance affected” which the Plan describes as water levels falling below the top of the well screens at minimum threshold levels. Although the Plans document the potential effects on well performance, the Plans do not describe or explicitly assess the quantity of wells that may be more permanently impacted such as lowering water levels below pump intakes or wells going completely dry. The EMA GSP does note, however, that there have been no reports from stakeholders of wells needing to be deepened or replaced and the Department’s Dry Well Reporting System does not show any reported dry wells in the management area.²⁷⁹ The WMA GSP and CMA GSP do not indicate if dry wells have been reported to the GSAs directly or on the Department’s reporting system. Department staff recommend the GSAs analyze where the proposed minimum thresholds are set relative to well construction information that would indicate whether or not more substantial impacts to beneficial users are occurring (i.e., depth of pump intake, bottom of the screen interval, well dewatering) (see [Recommended Corrective Action 4c](#)).

The Plan’s approach to maintain groundwater level conditions at or near historical lows and the consideration of the Basin’s water well infrastructure in the development of the minimum thresholds appears reasonable and will likely help avoid a significant and unreasonable depletion of supply in the Basin. However, as highlighted in the recommended corrective action above, the Plan should include additional supporting technical details that provides further description and disclosure regarding how the minimum thresholds and related definition of undesirable results for groundwater levels will help the GSA achieve its sustainability goal and avoid a depletion of supply.

4.3.2.2 Reduction of Groundwater Storage

In addition to components identified in 23 CCR §§ 354.28 (a-b), for the reduction of groundwater storage, the GSP Regulations require the minimum threshold for the reduction of groundwater storage to be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.²⁸⁰

Western Management Area (WMA) and Central Management Area (CMA) GSPs

The WMA and CMA GSPs describe significant and unreasonable reduction of groundwater storage as conditions when water is not physically present to be extracted for beneficial use. The Plan explains that a significant and unreasonable reduction may

²⁷⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.1, p. 336.

²⁸⁰ 23 CCR § 354.28(c)(2).

occur when groundwater extraction exceeds the management area's sustainable yield over a period containing both wet and dry water year types.²⁸¹

Regarding the WMA, the Plan estimates that approximately 27,300 AFY of groundwater is extracted from this management area, with most extractions occurring in the Lompoc Plain subarea. While the estimated annual groundwater extractions occurring in the management area are approximately 1,000 AFY higher than the perennial yield (i.e., sustainable yield); the GSP states that undesirable results related to chronic lowering of groundwater levels, seawater intrusion, water quality, land subsidence, and interconnected surface water sustainability indicators have not occurred.²⁸²

The Plan uses groundwater levels as a proxy for the reduction of groundwater storage sustainability indicator in both the WMA and CMA. The sustainable management criteria and monitoring network for reduction of groundwater storage are the same as those established for the chronic lowering of groundwater.²⁸³ Therefore, an undesirable result for the reduction of groundwater in storage will occur if over 50% of the representative monitoring wells in the principal aquifer, either the Upper or Lower Aquifer for the WMA, exceed their specific minimum threshold over two consecutive spring measurements during non-drought years.²⁸⁴

Being that groundwater levels are used as a proxy for reduction in groundwater storage, the WMA GSP and CMA GSP should be revised to reflect any modifications to the chronic lowering of groundwater levels sustainable management criteria.

Eastern Management Area (EMA) GSP

The EMA GSP describes conditions that could lead to significant and unreasonable reduction of groundwater storage (i.e., an undesirable result) as extended drought and elevated rates of groundwater extraction in the Paso Robles and Careaga Sand aquifers.²⁸⁵ The Plan explains that the significant and unreasonable conditions constituting an undesirable result include agricultural, municipal, and domestic wells being unable to produce historical average quantities of groundwater due to chronic decline in groundwater levels.²⁸⁶

The GSP states that significant or unreasonable effects associated with groundwater decline have not occurred in the management area based on groundwater users' input; however, the GSP acknowledges that if groundwater extraction rates continue at historic rates and drought conditions persist, undesirable results may occur in the future.

²⁸¹ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-2, p. 558; Santa Ynez River Valley Central Management Area GSP, Section 3b.2-2, p. 499.

²⁸² Santa Ynez River Valley Western Management Area GSP, Section 3b.2-2, p. 558.

²⁸³ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-2, p. 558.

²⁸⁴ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-2, pp. 558-559; Santa Ynez River Valley Central Management Area GSP, Section 3b.2-2, p. 499.

²⁸⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 5.6.1, p. 352.

²⁸⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 5.6.1, p. 353.

The Plan uses groundwater levels as a proxy for the reduction of groundwater storage sustainability indicator in the EMA. The sustainable management criteria and monitoring network for reduction of groundwater storage are the same as those established for the chronic lowering of groundwater.²⁸⁷

Being that groundwater levels are used as a proxy for reduction in groundwater storage, the EMA GSP should be revised to reflect any modifications to the chronic lowering of groundwater levels sustainable management criteria.

4.3.2.3 Seawater Intrusion

In addition to components identified in 23 CCR §§ 354.28 (a-b), for seawater intrusion, the GSP Regulations require the minimum threshold for seawater intrusion to be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.²⁸⁸

The WMA GSA borders the Pacific Ocean. The GSP states that seawater intrusion is not actively occurring within the management area. The GSP also states that groundwater production from the Lompoc Terrace and Burton Mesa is minimal, and that the subarea is under federal jurisdiction of the Vandenberg Space Force Base. The WMA GSP notes that chloride concentrations are historically greater than 650 mg/L in samples from wells within the extent of the Santa Ynez River Estuary, due to Santa Ynez River water mixing with seawater. Moreover, further inland, wells near the areas of groundwater production in the Lompoc Plain (i.e., approximately 2 miles from the coast) indicate stable chloride concentrations with the most recent measurement from August 2020 resulting in a chloride concentration of 490 mg/L.²⁸⁹

The GSP states that a potential undesirable result may occur if monitoring locations in the Upper Aquifer show landward migration of chloride isocontours, along with increasing groundwater chloride concentrations. To observe seawater intrusion conditions the WMA GSP describes a monitoring network consisting of 4 monitoring wells along the Santa Ynez River, one of which is located in the Santa Ynez River Estuary. The WMA GSP provides a map depicting the estuary, the 4 monitoring wells, and chloride isocontours.²⁹⁰

The GSP states that the current 500 mg/L chloride isocontour is located within the jurisdictional boundary of the Vandenberg Space Force Base which is not subject to SGMA. The WMA GSP describes the minimum threshold and effectively the undesirable result as "...the migration of the 500 mg/L chloride isocontour from a mile west of the Vandenberg Space Force Base boundary, to an eighth of a mile east of the Vandenberg Space Force Base boundary and into the primary production zone of the Lompoc Plain."²⁹¹ The GSP describes the process to annually evaluate and update the chloride

²⁸⁷ Santa Ynez River Valley Eastern Management Area GSP, Sections 5.6.2 through 5.6.4, pp. 353-359.

²⁸⁸ 23 CCR § 354.28(c)(3).

²⁸⁹ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-3, pp. 559-561.

²⁹⁰ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-3, pp. 562-563.

²⁹¹ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-3, p. 591.

isocontour to determine the effects of groundwater production in the Lompoc Plain on the possible migration of seawater inland beyond the Vanderberg Space Force Base.²⁹²

As a result of current chloride concentrations in monitoring wells adjacent to the estuary being reflective of natural conditions, the measurable objective for seawater intrusion is the current location of the 500 mg/L chloride concentration.²⁹³ The interim milestone is equivalent to the measurable objective.²⁹⁴

Department staff conclude that the GSP's discussion and presentation of information on seawater intrusion covers the specific items listed in the GSP Regulations in an understandable format using appropriate data. Department staff do suggest coordinating with the Vandenberg Space Force Base to the extent possible, especially being that seawater intrusion could continue to encroach inland within the jurisdictional boundary of the Space Force Base before a minimum threshold exceedance or an undesirable result occurrence.

4.3.2.4 Degraded Water Quality

In addition to components identified in 23 CCR §§ 354.28 (a-b), for degraded water quality, the GSP Regulations require the minimum threshold for degraded water quality to be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.²⁹⁵

Western Management Area GSP

The WMA GSP highlights a statement from the Central Coast Regional Water Quality Control Board's Central Coastal Basin Plan which describes water quality in the management area as in a state of "adverse salt balance because of municipal and agricultural discharges."²⁹⁶ Based on the Water Quality Objectives (WQOs) from the Central Coastal Basin Plan, the GSP identifies TDS, chloride, sulfate, boron, sodium, and nitrogen as constituents of concern. The WMA GSP also states that the GSA is only responsible for water quality degradation that is a result of groundwater pumping or GSP implementation.²⁹⁷

The WMA GSP explains that, for much of the management area, the average concentrations of constituents of concern (from samples collected between 2015 to 2018)

²⁹² Santa Ynez River Valley Western Management Area GSP, Section 3b.3-3, pp. 590-591.

²⁹³ Santa Ynez River Valley Western Management Area GSP, Section 3b.4-3, p. 600.

²⁹⁴ Santa Ynez River Valley Western Management Area GSP, Section 3b.5-3, p. 604.

²⁹⁵ 23 CCR § 354.28(c)(4).

²⁹⁶ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-4, p. 565.

²⁹⁷ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-4, p. 567.

exceeded the WQOs listed in the Central Coastal Basin Plan. The WMA GSP presents the median WQOs for the four subareas used to delineate water quality conditions in the management area (i.e., Lompoc Plain, Lompoc Upland, Lompoc Terrace, and Santa Rita Upland) in comparison to the average concentrations of the constituents of concern between 2015 and 2018.²⁹⁸ The WMA GSP states that “during the last forty years pumping has been relatively constant in the WMA, but recent trends indicate increasing nitrate, arsenic, and total dissolved solids in 22% to 36% of all wells in the Lompoc Plain.” A water quality assessment study referenced in the GSP indicates that these recent trends may be a result of discharged treated wastewater, agriculture, and industrial sources.²⁹⁹ However, the WMA GSP does not describe or evaluate in detail how or why these potential sources have led to the degradation of water quality or how they are distinct from activities within the GSA’s jurisdiction such as pumping and implementation of projects and management actions.

The GSP states “[g]roundwater management decisions and pumping can influence local well water quality. Hence, minimum threshold exceedances for individual constituents in more than 50% of the representative monitoring wells for two or more consecutive years is considered an undesirable result associated with degradation of water quality in the WMA.” The WMA GSP also qualifies this definition by noting that only non-drought years will be considered in evaluating undesirable results.³⁰⁰ As previously discussed with the undesirable definition for the chronic lowering of groundwater levels, Department staff conclude that the GSA should not include water year type exclusions in the quantitative definition of undesirable results for degradation of water quality.

For the Lompoc Terrace and Santa Rita Upland subareas, the Plan states that average concentrations between 2015-2018 for the constituents of concern are currently below the WQOs. Therefore, for these two subareas, the GSP establishes the minimum thresholds for degraded water quality for all constituents of concern, apart from nitrate, at the median WQOs from the Central Coastal Basin Plan.³⁰¹ The Plan states that salt and nutrient concentrations in the Lompoc Plain and Lompoc Upland currently exceed the WQOs. Therefore, the minimum thresholds for these areas are set “near” current concentrations.³⁰² The Plan states that minimum thresholds in these subareas were established to “improve groundwater quality within the WMA and provide operational flexibility for beneficial users of groundwater...”. The minimum threshold established at each individual well is depicted on the water quality trend graphs included in Appendix 3b-D.³⁰³ However, the Plan does not provide an explanation for how these minimum threshold concentrations were derived. Furthermore, within the appendix, Department staff noted that there are also trend graphs for wells in the Santa Rita Uplands which

²⁹⁸ Santa Ynez River Valley Western Management Area GSP, Table 2b.3-1, pp. 565-566.

²⁹⁹ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-4, p. 567.

³⁰⁰ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-4, p. 568.

³⁰¹ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-4, p. 591.

³⁰² Santa Ynez River Valley Western Management Area GSP, Section 3b.3-4, p. 592.

³⁰³ Santa Ynez River Valley Western Management Area GSP, Appendix 3B-D, pp. 1241-1296.

depict different minimum thresholds than those described in the text of the GSP (i.e. the WQOs, as discussed above). Similarly, the Plan notes that the minimum threshold for nitrate is set equivalent to the Maximum Contaminant Level (MCL) of 10 mg/L — which, based on the Plan’s description,³⁰⁴ Department staff understood would be applied to all wells in the WMA. However, upon review of the trend graphs in Appendix 3b-D and the values listed in Table 3b.3-1,³⁰⁵ it does not appear that any wells are assigned a minimum threshold of 10 mg/L for nitrate (nor does Table 3b.3-1 represent the water quality objectives as the minimum thresholds for the other constituents in wells located within the Santa Rita Uplands). Based on these discrepancies, it is unclear to Department staff what the actual minimum thresholds are for most wells in the WMA. Department staff recommend that the Plan reconcile these discrepancies by clearly defining the minimum thresholds for each representative monitoring well as well as explain the methodology used to derive the minimum thresholds (where they are established “near” current conditions). Further, given the lack of clarity on this issue —and that the minimum thresholds for the WMA currently have to be discerned from multiple graphs, tables, and text — Department staff recommend that the GSA compile the minimum thresholds; measurable objectives; and interim milestones for each well in the WMA in tabular format which also clearly indicates the rationale for each minimum threshold selected (i.e., WQO, MCL, or current condition).

The WMA GSP states that the measurable objectives³⁰⁶ and interim milestones³⁰⁷ for the degraded water quality sustainability indicator are set “equal to the minimum of the secondary maximum contaminant level (where applicable) and the 2015 groundwater concentration.”³⁰⁸ Department staff note that the Plan’s measurable objective narrative appears to be inconsistent with the actual values listed in Table 3b.4-1.³⁰⁹ Therefore, staff reiterate the need to have this information clearly and consistently presented and described in the Plan.

Central Management Area GSP

Like the WMA, the CMA GSP states that the GSA is only responsible for addressing degraded water quality caused by groundwater extraction or GSP implementation. The CMA GSP states that the relationship between groundwater extraction and water quality is a data gap and there may be multiple causes of groundwater quality degradation in the management area.³¹⁰ The Plan identifies TDS, chloride, sulfate, boron, sodium, and nitrate as constituents of concern for the CMA.³¹¹ Table 3b.2-1 in the GSP indicates that

³⁰⁴ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-4-1, p. 592.

³⁰⁵ Santa Ynez River Valley Western Management Area GSP, Table 3b.3-1, pp. 582-583.

³⁰⁶ Santa Ynez River Valley Western Management Area GSP, Section 3b.4-4, p. 600.

³⁰⁷ Santa Ynez River Valley Western Management Area GSP, Section 3b.5-4, p. 604.

³⁰⁸ Santa Ynez River Valley Western Management Area GSP, Section 3b.4-4, p. 600.

³⁰⁹ Santa Ynez River Valley Western Management Area GSP, Table 3b.4-1, pp. 598-599.

³¹⁰ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-4, pp. 500-501.

³¹¹ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-4-2, p. 501.

the average concentrations for constituents of concern (collected between 2015-2018) were below the WQO or MCL for the Basin.³¹²

The GSP states that “[g]roundwater management decisions and pumping can influence local well water quality. Hence, minimum threshold exceedances for individual constituents in more than 50% of the representative monitoring wells for two or more consecutive years is considered an undesirable result associated with degradation of water quality in the WMA.”³¹³ The CMA GSP also qualifies this definition by noting that only non-drought years will be considered in evaluating undesirable results. Department staff conclude that the GSA should not include water year type exclusions in the quantitative definition of undesirable results for degradation of water quality.

The GSP discusses the effects of undesirable results related to degraded water quality on beneficial uses and users. The Plan notes potential effects include impacts to crop production as well as increased municipal water treatment costs for drinking water suppliers.³¹⁴

Minimum thresholds for degraded water quality constituents of concern, excluding TDS and nitrate, are set at the median WQOs established in the Central Coastal Basin Plan.³¹⁵ Minimum thresholds for TDS and nitrate are equivalent to the Secondary Maximum Contaminant Level (SMCL) of 1,000 mg/L and MCL of 10 mg/L, respectively.³¹⁶ The GSP states that the degraded water quality minimum thresholds will not negatively impact beneficial uses and users as they are near current salt and nutrient concentrations.

The GSP states that the measurable objectives³¹⁷ and interim milestones³¹⁸ for the degraded water quality sustainability indicator are equivalent to the WQOs, or in the case of TDS and nitrate, the SMCL and MCL. However, the GSP does not clearly explain the rationale for setting the measurable objective equal to the minimum threshold but acknowledges that, essentially, “measurable objectives are not specifically set for water quality.” The GSP explains that minimum thresholds will be reevaluated if constituents of concern exhibit an increasing trend in concentration over the GSP implementation period.

Eastern Management Area (EMA) GSP

The GSP states that conditions potentially associated with an undesirable result for degraded water include:

³¹² Santa Ynez River Valley Central Management Area GSP, Table 3b.2-1, p. 503.

³¹³ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-4-2, p. 508.

³¹⁴ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-4-2, p. 508.

³¹⁵ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-4, p. 521.

³¹⁶ Santa Ynez River Valley Central Management Area GSP, Table 3b.3-1, p. 517, Section 3b.3-4, p. 522.

³¹⁷ Santa Ynez River Valley Western Management Area GSP, Section 3b.4-4, p. 526.

³¹⁸ Santa Ynez River Valley Western Management Area GSP, Section 3b.5-4, p. 529.

- Concentrations of regulated contaminants in untreated groundwater extracted from private domestic wells, agricultural wells, or municipal wells exceed regulatory thresholds as a result of pumping or GSA activities.
- Groundwater pumping or GSA activities cause concentrations of identified constituents of concern to exceed WQOs and are greater than concentrations since SGMA was enacted in January 2015.³¹⁹

The EMA GSP does not explicitly establish a quantitative definition of undesirable results related to the degradation of water quality. Rather, the GSA intends to “avoid increased degradation of groundwater quality from baseline concentrations since enactment of SGMA in January 2015.” The EMA GSP states the minimum thresholds for the constituents of concern (i.e., TDS, chloride, sulfate, boron, sodium, and nitrate) are set at the WQO or MCL concentration or “the concentrations present when SGMA was enacted (January 2015).”³²⁰ The GSA further explains that the minimum threshold for the constituents is triggered if 50% of the representative monitoring sites are equal to or exceed the WQO, MCL, or January 2015 concentration. It appears to Department staff that the GSA is conflating the establishment of minimum thresholds with defining quantitative criteria for undesirable results.

Department staff believe using the WQO, MCL, or the January 2015 concentration for the constituents of concern is effective as the basis for the minimum threshold for degraded water quality. Meaning, if the concentration in a representative monitoring site were to exceed those previously defined regulatory limits, then that monitoring location would be exceeding its minimum threshold. The GSP Regulations, however, require the GSAs to evaluate the conditions the agency deems significant and unreasonable and set quantitative metrics using a combination of minimum threshold exceedances to determine when those conditions or undesirable results are occurring. The EMA GSP indicates that the GSA evaluated the significant and unreasonable conditions as described in the two bulleted items above in relation to the undesirable result. The GSA also appears to consider local, state, and federal water quality standards as minimum thresholds. However, while the GSP states that minimum thresholds are “concentrations of TDS, chloride, sulfate, boron, sodium, and nitrate are equal to or greater than WQOs in 50 percent of representative wells or are equal to concentrations present when SGMA was enacted (January 2015),”³²¹ it does not provide the rationale for the metric requiring 50% of representative wells to exceed minimum thresholds to define undesirable results. Nor does it explain how that proportion of well exceedances represents the point where significant and unreasonable conditions would occur, which the GSA is trying to avoid.

The GSP states that the measurable objectives for degraded water quality are equivalent to or below the WQOs or concentrations present in groundwater when SGMA was

³¹⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.8.1, pp. 360-361.

³²⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 5.8.2.2, p. 364.

³²¹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.8.2.2, p. 364.

enacted.³²² The GSP states that interim milestones were not established for degraded water quality because no significant or unreasonable results have been observed in the management area.³²³

The EMA GSP currently establishes a minimum threshold for degraded groundwater quality as 50% of representative monitoring sites equaling or exceeding the WQO, MCL, or January 2015 concentration for the constituents of concern. The GSP, while describing conditions that may lead to undesirable results, does not provide a quantitative description of the combination of minimum threshold exceedances that would be expected to cause significant and unreasonable effects in the Basin, as required by the GSP Regulations.³²⁴ Department staff do not believe this oversight should preclude GSP approval at this time, because the GSP states the goal of the GSA's management is to avoid increased degradation of groundwater quality beyond January 2015 conditions and incorporates the Central Coastal Basin Plan WQOs and MCLs as sustainable management criteria. Department staff suggest that the EMA GSA revisit the quantitative definition of an undesirable result to incorporate a combination of minimum threshold exceedances, similar to the WMA GSP and CMA GSP (see [Recommended Corrective Action 5a](#)).

As described above, the Plan does not describe or evaluate in detail how or why the potential other causes of increased salt and nutrients described in the GSPs (i.e., treated wastewater, agriculture, industrial sources, etc.), would be contributing to degradation of water quality. Additionally, the Plan does not describe how or why those causes are distinct from GSA activities (i.e., pumping and projects and management actions) including an evaluation of how GSA activities could influence degradation of water quality. The GSAs should provide an assessment of when and how GSA activities may impact water quality and how the GSA may discern whether or not the increased degradation of water quality is distinct from the “other causes of increase salt and nutrients” as noted in the Plans (see [Recommended Corrective Action 5b](#)).

The WMA GSP and CMA GSP state an undesirable result for the degraded water quality sustainability indicator would occur when minimum thresholds for each constituent of concern is exceeded at 50% or more of representative monitoring wells for two or more consecutive years, as a result of groundwater extraction or GSP implementation. The WMA GSP and CMA GSP implies that an undesirable result will only be considered in non-drought years. As previously discussed with the undesirable definition for the chronic lowering of groundwater levels, Department staff conclude that the GSA should not include water year type exclusions in the quantitative definition of undesirable results for degradation of water quality. (see [Recommended Corrective Action 5c](#)).

³²² Santa Ynez River Valley Eastern Management Area GSP, Section 5.8.3, pp. 367-368.

³²³ Santa Ynez River Valley Eastern Management Area GSP, Section 5.8.4, p. 368.

³²⁴ 23 CCR § 354.26(b)(2).

Both the WMA GSP and the CMA GSP compare WQOs to average concentrations of constituents of concern from 2015 to 2018. Both plans, however, do not explain how those average 2015 to 2018 concentrations were derived (i.e., total amount of measurements analyzed, from what wells, location of wells, etc.) and how those concentrations relate to the WQO values for the various constituents of concern. Additionally, while the EMA GSP presents a table with the WQOs for the various constituents of concern, the GSP does not include concentrations observed in January 2015 which the EMA GSP describes as the “baseline concentrations since enactment of SGMA in January 2015.”³²⁵ The Plans also do not clearly convey the minimum threshold values for each representative monitoring well including explaining which methodology was used (i.e., WQO, MCL, current conditions) to derive the minimum thresholds – especially where they are established “near” current conditions. Further, given the lack of clarity on this issue — and being that Department staff have evaluated the minimum thresholds for the WMA and CMA from multiple graphs, tables, and text — Department staff recommend the GSA compile the minimum thresholds; measurable objectives; and interim milestones for each well in a tabular format indicating the minimum threshold value and any comparative averages and baseline conditions. The presentation of this information should also clearly indicate the rationale for how each minimum threshold was selected (see [Recommended Corrective Action 5d](#)).

Department staff conclude that the sustainable management criteria for the degradation of water quality are generally commensurate with the understanding of the basin setting, responsive to comments from interested parties, and reasonably consider the groundwater uses and users in the Basin. However, Department staff have identified a recommended corrective action for the GSA to reevaluate and potentially revise the components of the sustainable management criteria for degraded water quality by the first Periodic Evaluation.

4.3.2.5 Land Subsidence

In addition to components identified in 23 CCR §§ 354.28 (a-b), the GSP Regulations require the minimum threshold for land subsidence to be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.³²⁶ Minimum thresholds for land subsidence shall be supported by identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, the Agency’s rationale for establishing minimum thresholds in light of those effects, and maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum thresholds and measurable objectives.³²⁷

³²⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 5.8.2, p. 361.

³²⁶ 23 CCR § 354.28(c)(5).

³²⁷ 23 CCR §§ 354.28(c)(5)(A-B).

Western Management Area (WMA) GSP

The WMA GSP states that undesirable results due to inelastic land subsidence are not occurring nor likely to occur in the future because of little to no evidence of impacted infrastructure, land use, or beneficial use of groundwater.³²⁸ The WMA GSP states that the principal aquifers in the management area consist of primarily coarser material (i.e., up to 70 percent coarse material)³²⁹ and do not pose a risk of inelastic subsidence. The GSP further explains that for at least the last 100 years impacts to infrastructure or surface land uses due to subsidence have not been observed or reported.³³⁰ The WMA contains one continuous global positioning system station that has indicated minimal to no vertical displacement since May 2015. The GSP also provides a brief discussion of InSAR data collected in the management area from January 2015 to September 2019 which indicates a maximum cumulative vertical displacement of approximately 1 inch in some areas of the management area.³³¹

As mentioned above, the WMA GSP states that “[l]and subsidence from groundwater extraction is not expected to become an undesirable result within the WMA due to hydrogeologic conditions that are not conducive to land subsidence and because SMCs for other sustainability indicators will preclude the lowering of groundwater levels below the historical low elevation.”³³² The WMA GSP establishes the undesirable result and minimum threshold at 0.5 feet of cumulative subsidence, due to groundwater extraction, that “interferes with land uses or infrastructure.” The WMA GSP states the GSA will observe subsidence conditions via InSAR data provided by the Department and the continuous GPS station located in the management area.³³³

Central Management Area (CMA) GSP

The CMA GSP states that inelastic land subsidence is not an issue of concern in the management area. The CMA GSP explains that the principal aquifers in the management area consist of primarily coarser material (i.e., up to 70 percent coarse material) and do not pose a risk of inelastic subsidence. The CMA contains one continuous global positioning system station that has indicated minimal to no vertical displacement since January 2015. The GSP also provides a brief discussion of InSAR data collected in the management area from January 2015 to September 2019 which indicates a general range of vertical displacement for most of the management area between an estimated increase of 0.5 inch to a decrease of 0.5 inch.³³⁴

³²⁸ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-5, p. 568.

³²⁹ Santa Ynez River Valley Western Management Area GSP, Section 2b.5-1, p. 398.

³³⁰ Santa Ynez River Valley Western Management Area GSP, Section 2b.5-2, p. 398.

³³¹ Santa Ynez River Valley Western Management Area GSP, Section 2b.5, pp. 398-403.

³³² Santa Ynez River Valley Western Management Area GSP, Section 3b.2-5, p. 573.

³³³ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-5, p. 573, Section 3b.3-5, p. 592.

³³⁴ Santa Ynez River Valley Central Management Area GSP, Section 2b.5, pp. 350-355.

The CMA GSP establishes the undesirable result and minimum threshold at 0.5 feet of cumulative subsidence, due to groundwater extraction, that “interferes with land uses or infrastructure.” The CMA GSP states the GSA will observe subsidence conditions via InSAR data provided by the Department and the continuous GPS station located in the management area.³³⁵

Eastern Management Area (EMA) GSP

The EMA GSP states that available data indicates that the geologic materials that comprise the Basin are not susceptible to subsidence. The GSP explains that InSAR and UNAVCO data indicate land surface elevations declined on average 0.015 feet annually from 2015 to 2019. The analysis of the UNAVCO GPS Stations estimated that land surface elevations surrounding the Basin declined approximately 0.03 feet from 2001 to 2020.³³⁶ In addition to these analyses, the GSA conducted an evaluation to supplement the InSAR and UNAVCO data by assessing the long-term land surface elevation changes caused specifically by groundwater extraction. This evaluation included the development stratigraphic profiles from well logs and an estimation of potential long-term subsidence effects associated with changes in groundwater elevation.³³⁷

The subsidence evaluation states that “there has been no reported historical or anecdotal information regarding land subsidence as a result of groundwater extractions. There may be, and likely has been some subsidence as a result of groundwater extraction, but we are not aware of documented impacts to surface features.” However, the evaluation also indicates that, based on the review of well driller’s logs, soil type varies across the management area and that there are “relatively thick sections of clayey materials.” Based on the clay material in the aquifer system, the subsidence evaluation analytical model estimated that 0.5 to 3 feet of potential subsidence could occur as a result of groundwater elevation change. However, the evaluation concludes that reaching 3 feet of subsidence is unlikely to occur, unless groundwater elevations were to significantly decline.³³⁸ The subsidence evaluation recommends that, because future declines in groundwater could lead to subsidence, the GSA should maintain groundwater levels at or above historical lows.³³⁹

The EMA GSP states that an undesirable result would occur if “significant and unreasonable subsidence caused by groundwater extraction exceeds the minimum threshold and causes damage to structures and infrastructure and substantially interferes with surface land uses.”³⁴⁰ The minimum threshold for land subsidence is established as exceeding 0.08 feet per year of subsidence for 3 consecutive years which equates to a

³³⁵ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-5, p. 521.

³³⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 5.9.1, p. 370.

³³⁷ Santa Ynez River Valley Eastern Management Area GSP, Appendix E, pp. 604-628.

³³⁸ Santa Ynez River Valley Eastern Management Area GSP, Appendix E, p. 610.

³³⁹ Santa Ynez River Valley Eastern Management Area GSP, Appendix E, p. 613.

³⁴⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 5.9.1, p. 370.

minimum of 0.24 feet of cumulative of subsidence over that three-year period.³⁴¹ Department staff note that the GSA appears to conflate the undesirable result with the minimum threshold. According to the GSP Regulations, the minimum threshold for subsidence should be a rate or total amount of subsidence set at a monitoring location that if exceeded could lead to undesirable results (e.g. 0.08 feet per year). Per the Regulations, an ‘undesirable result’ should be quantified based on a “combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin” (e.g., 3 years of minimum threshold exceedances — indicating significant and unreasonable conditions are occurring throughout the basin). The EMA GSP does indicate in Table 5-4 that the minimum threshold for land subsidence is equal to 0.08 feet per year as observed via InSAR or UNAVCO GSP station.³⁴² Therefore, Department staff’s understanding is that if the GSA were to observe 0.08 feet per year of subsidence than that constitutes a minimum threshold exceedance and then if that 0.08 feet per year were to be observed for 3 consecutive years that would indicate an undesirable result. However, Department staff conclude that each of the GSPs should clarify what specifically the GSA considers an undesirable result for land subsidence (see [Recommended Corrective Action 6](#)).

Department staff have identified components of the sustainable management criteria for subsidence that should be revised or clarified by the first periodic evaluation of the Plan, as discussed above and highlighted in the recommended corrective actions included in [Section 5](#). However, Department staff conclude that the sustainable management criteria for land subsidence are generally commensurate with the understanding of the basin setting, responsive to interested party feedback, and reasonably consider the groundwater uses and users in the Basin. Considering the Basin has not historically observed impacts to land use due to subsidence nor have the GSAs measured subsidence at rates that exceed the level of uncertainty in the measurement of both InSAR and ground-based monitoring sites, Department staff believe the Plan’s approach to manage subsidence is reasonable and well supported. Department staff also note that the GSAs have set groundwater level minimum thresholds generally at or near historic lows indicating that new significant subsidence is unlikely to occur, as was concluded in the EMA subsidence evaluation.

4.3.2.6 Depletions of Interconnected Surface Water

SGMA defines undesirable results for the depletion of interconnected surface water as those that have significant and unreasonable adverse impacts on beneficial uses of surface water and are caused by groundwater conditions occurring throughout the basin.³⁴³ The GSP Regulations require that a Plan identify the presence of interconnected surface water systems in the basin and estimate the quantity and timing of depletions of

³⁴¹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.9.2, p. 372.

³⁴² Santa Ynez River Valley Eastern Management Area GSP, Section 5.9.2, p. 372.

³⁴³ Water Code § 10721(x)(6).

those systems.³⁴⁴ The GSP Regulations further require that minimum thresholds be set based on the rate or volume of surface water depletions caused by groundwater use, supported by information including the location, quantity, and timing of depletions, that adversely impact beneficial uses of the surface water and may lead to undesirable results.³⁴⁵

The Plan acknowledges the presence of interconnected surface waters in the Basin.

Western Management Area (WMA) GSP

The WMA GSP does not quantify the rate or volume of surface water depletions due to groundwater pumping as the sustainable management criteria as required by the GSP Regulations.³⁴⁶ Instead, the GSP proposes to utilize groundwater levels as a proxy for interconnected surface waters.

The GSP states that an undesirable result for the depletion of interconnected surface water sustainability indicator may occur when surface water replaces extracted groundwater as a result of reduced baseflow. The WMA GSP identifies the Santa Ynez River as the primary interconnected surface water body within the management area.³⁴⁷

The GSP defines the occurrence of an undesirable result for interconnected surface water as "...groundwater elevations in the Upper Aquifer that drop to 10 feet below 2020 groundwater elevations in two out of the three representative monitoring wells for two consecutive non-drought years."³⁴⁸ Undesirable results were evaluated using historical groundwater extraction and management information to understand surface water depletion prior to 2015. The Plan states that undesirable results could occur if Santa Ynez River flows are reduced below pre-2015 conditions or if the groundwater table in the upper aquifer is lowered to pre-2015 levels.³⁴⁹ The WMA GSP explains that conditions associated with an undesirable result for interconnected surface water include lowered "groundwater elevations that impact habitat health and enhance surface water depletion rates along the Santa Ynez River."³⁵⁰ The GSP states that undesirable results associated with a depletion of interconnected surface water by groundwater pumping has not historically occurred, nor is currently occurring, within the management area.³⁵¹

The WMA GSP describes several GDEs and species associated with the Santa Ynez River including seasonally flooded wetland habitats, riparian mixed hardwood, coast live oak, willow, southwestern willow flycatcher, and southern California steelhead trout. Two key species were identified in the GSP, the southwestern willow flycatcher and the

³⁴⁴ 23 CCR § 354.16 (f).

³⁴⁵ 23 CCR § 354.28 (c)(6).

³⁴⁶ 23 CCR § 354.28 (c)(6).

³⁴⁷ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, p. 574.

³⁴⁸ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, p. 576.

³⁴⁹ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, pp. 576-579.

³⁵⁰ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, pp. 576-579.

³⁵¹ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, p. 575.

southern California steelhead. Qualitatively, the Plan explains that an undesirable result for southwestern willow flycatchers would occur if groundwater elevations fell below pre-2015 levels and cause a decrease in quantity and density of vegetation used by the species or a decrease in surface water habitat during its nesting season.³⁵² An undesirable result for the southern California steelhead would likely occur if groundwater elevations fell below pre-2015 levels; however, the Plan notes that multiple factors contribute to steelhead habitat that are not completely known by the GSA. As a result, the GSP intends to manage groundwater extraction in a manner that avoids depletions of interconnected surface water impacts greater than those observed prior to 2015.³⁵³ Outside of the listed GDEs, the GSP does not discuss impacts of the depletion of interconnected surface undesirable results on beneficial uses and users.

The GSP uses groundwater levels as a proxy for establishing the minimum threshold for the depletion of interconnected surface water. Three representative monitoring wells, each located in the Upper Aquifer and adjacent to the Santa Ynez River, have minimum thresholds established 10 feet below spring 2020 groundwater elevations. The GSP states that the minimum thresholds will allow the water table to drop within historical conditions and maintain water levels within typical rooting depths for GDEs.³⁵⁴

The measurable objectives for the depletion of interconnected surface water were established at five feet below the channel thalweg of the Santa Ynez River. The WMA GSP states the measurable objectives ensure that soil would remain wet to support GDEs along the riparian corridor.³⁵⁵ The interim milestones for interconnected surface water are equivalent to the measurable objectives.³⁵⁶

Central Management Area (CMA) GSP

The CMA GSP states that the Santa Ynez River, and channel alluvium, is underlain by bedrock west of the Buellton Bend (thus not in contact with the Buellton Aquifer).³⁵⁷ The GSP acknowledges that a data gap exists between the Buellton Aquifer and the underflow deposits east of Buellton Bend, specifically the quantity and timing of surface water flow from Buellton Aquifer to these deposits.³⁵⁸ The Plan states that this data gap will be evaluated as part of the Plan's projects and management actions.

For the sustainable management criteria, the GSP does not quantify the rate or volume of surface water depletions due to groundwater pumping as required by the GSP

³⁵² Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, p. 579.

³⁵³ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, p. 580.

³⁵⁴ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-6, p. 595.

³⁵⁵ Santa Ynez River Valley Western Management Area GSP, Section 3b.4-6, p. 601.

³⁵⁶ Santa Ynez River Valley Western Management Area GSP, Section 3b.5-6, p. 604.

³⁵⁷ Santa Ynez River Valley Central Management Area GSP, Section 2b.6-2, p. 364.

³⁵⁸ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-6, p. 511.

Regulations.³⁵⁹ Instead, the GSP proposes to utilize groundwater levels as a proxy for interconnected surface water.

The CMA GSP states that an undesirable result for the depletion of interconnected surface water sustainability indicator in the management area may occur when surface water replaces extracted groundwater as a result of reduced baseflow.³⁶⁰ The GSP defines the occurrence of an undesirable result for interconnected surface water as "...groundwater elevations that drop 15 feet below the channel thalweg elevations in two out of the three representative monitoring wells for two consecutive non-drought years."³⁶¹ Undesirable results were evaluated using historical groundwater extraction and management information and an established baseline. The baseline was established by determining groundwater extraction and management that caused surface water depletion prior to 2015.

Similar to the WMA GSP, the CMA GSP discusses undesirable result for GDEs, which would occur when groundwater elevations fall below the root zone and are no longer able to support the ecosystem.³⁶² Two key species were identified in the GSP, the southwestern willow flycatcher and the southern California steelhead. Qualitatively, the Plan explains that an undesirable result for southwestern willow flycatchers would occur if groundwater elevations fell below pre-2015 levels and caused a decrease in quantity and density of vegetation used by the species or a decrease in surface water habitat during its nesting season.³⁶³ An undesirable result for the southern California steelhead would likely occur if groundwater elevations fell below pre-2015 levels due to groundwater extractions that cause a decrease in surface flow below one of the flow requirements for any life stage.³⁶⁴ The GSP does not discuss or reference the flow requirements needed for the southern California steelhead during its life stages. Outside of the listed GDEs and key species, the GSP does not discuss impacts on beneficial uses and users resulting from the depletion of interconnected surface water.

The CMA GSP plans to use groundwater levels as a proxy for depletion of interconnected surface water minimum thresholds. It is the Department's understanding that at each of the three representative monitoring locations for interconnected surface water in the CMA, the minimum threshold is set at groundwater elevations 15 feet below the river channel thalweg. However, Department staff note that the Plan's description of minimum thresholds is confusing as the Plan also discusses potential minimum thresholds for GDEs which will be set 15 feet below ground surface and includes a conditional statement that a threshold exceedance must also "correspond with a decline in GDE health."³⁶⁵

³⁵⁹ 23 CCR § 354.28 (c)(6).

³⁶⁰ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-6, p. 510.

³⁶¹ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-6, p. 513.

³⁶² Santa Ynez River Valley Central Management Area GSP, Section 3b.2-6-1, pp. 511-512.

³⁶³ Santa Ynez River Valley Central Management Area GSP, Section 3b.2-6, pp. 514.

³⁶⁴ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-6, pp. 522.

³⁶⁵ Santa Ynez River Valley Central Management Area GSP, Section 3b.3-6, pp. 522.

Department staff believe that some of the confusion comes from the Plan conflating developing management criteria for interconnected surface water with observing impacts to GDEs.

It is the Department's understanding that at each of the three representative monitoring locations for interconnected surface water in the CMA, the measurable objective is set at groundwater elevations 5 feet below the river channel thalweg. However, again this was somewhat confusing given the Plan's description of the measurable objective in relation to both GDEs and interconnected surface water.³⁶⁶ The interim milestones for interconnected surface water are equivalent to the measurable objectives (i.e., groundwater levels five feet below the Santa Ynez River channel thalweg).³⁶⁷

Eastern Management Area (EMA) GSP

The EMA GSP states that an undesirable result for the depletion of interconnected surface water may occur when groundwater levels decline as a result of groundwater extraction in areas of interconnectedness and during periods of severe drought.³⁶⁸ The GSP identifies portions of the Alamo Pintado and Zanja De Cota creeks, near the confluence of the Santa Ynez River, as areas where groundwater and surface water are interconnected.

The Plan does not provide a quantitative description of an undesirable result based on a combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin, as required by the GSP Regulations. The GSP describes an undesirable result for interconnected surface water as “[p]ermanent loss or significant and unreasonable adverse impacts to existing native riparian or aquatic habitat in the Category A GDE area [i.e., GDEs associated with a principal aquifer] due to lowered groundwater levels caused by pumping.”³⁶⁹ The Plan utilized GDE data, interconnected surface water locations, groundwater elevation data, and a groundwater flow model to define the undesirable result.³⁷⁰ The GSP states that a sustained drop in groundwater elevations below the root zones of the identified GDEs could result in permanent loss of GDEs and reduce surface water discharge to the Santa Ynez River.

The EMA GSP plans to use groundwater levels as a proxy for the depletions of interconnected surface water. A numerical groundwater model was used to assess the timing and magnitude of potential depletions of interconnected surface water as well as projected land use, groundwater extraction, and climate impacts on beneficial users. The results of the numerical model concluded that surface water discharges would decrease less than 25 AFY in the Alamo Pintado Creek³⁷¹ over the GSP implementation horizon

³⁶⁶ Santa Ynez River Valley Central Management Area GSP, Section 3b.4-6, pp. 526-527.

³⁶⁷ Santa Ynez River Valley Central Management Area GSP, Section 3b.5-6, p. 529.

³⁶⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.1, pp. 377-378.

³⁶⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.1, p. 379.

³⁷⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.1, p. 378.

³⁷¹ Santa Ynez River Valley Eastern Management Area GSP, Figure 5-4, p. 382.

while discharges would decrease by approximately 100 AFY in the Zanja de Cota Creek³⁷² during the same period. The GSP acknowledges that climate change will greatly impact the modeled surface water discharges, particularly the years post-2050. Based on the results of the numerical groundwater model and information on identified GDEs, the minimum thresholds will be established for interconnected surface water at 15 feet below the bottom of the stream beds of the Alamo Pintado and Zanja de Cota Creek (as measured by piezometers proposed to be installed in areas containing GDEs).³⁷³ The GSA intends to review and reevaluate the interconnected surface water minimum thresholds as data gaps are filled and the proposed monitoring locations are installed.

The GSP concludes that the numerical groundwater model results indicate the minimum thresholds will continue to support flows to the Central Management Area.³⁷⁴ The interconnected surface water minimum thresholds are not anticipated to negatively impact beneficial uses and users; however, the GSP acknowledges that the results of the numerical groundwater model indicate that future climate change may have an effect on these uses and users.³⁷⁵

The measurable objectives for the depletion interconnected surface water are groundwater elevations five feet below the stream bed in Alamo Pintado and Zanja de Cota creeks.³⁷⁶ The Plan states that the measurable objective was selected based on the GDE root zones depths. Category A GDEs are described as having root zone depths well beyond five feet below the streambed. Interim milestones were not established for interconnected surface water based on the lack of known or documented significant and unreasonable impacts to beneficial uses and users.³⁷⁷ While the GSP concludes that significant and unreasonable impacts are not anticipated to occur, Department staff recommend that the GSP consider establishing interim milestones for interconnected surface water.

Department staff do not understand the Plan's rationale for establishing both minimum thresholds and measurable objectives below the thalweg or the Santa Ynez River in the WMA and CMA, and below tributary stream beds in the EMA. Department staff note that if the GSAs were to manage groundwater levels within the operational range between the measurable objective and minimum threshold this would result in conditions where surface water is being lost to the groundwater system (likely increasing current depletion rates). Furthermore, the Plan states that undesirable results could occur if groundwater levels fell below pre-2015 levels or historical low levels. To this point, Department staff note that the hydrographs for representative monitoring wells in the WMA³⁷⁸ and CMA³⁷⁹

³⁷² Santa Ynez River Valley Eastern Management Area GSP, Figure 5-5, p. 383.

³⁷³ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.2, pp. 384-385.

³⁷⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.2.2, p. 386.

³⁷⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.2.3, p. 386.

³⁷⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.3, p. 388.

³⁷⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 5.10.4, p. 389.

³⁷⁸ Santa Ynez River Valley Western Management Area GSP, Appendix 3B-E, pp. 1209-1302.

³⁷⁹ Santa Ynez River Valley Central Management Area GSP, Appendix 3B-D, pp. 1121-1124.

indicate that historical groundwater elevation trends have generally been much more closely aligned with the elevation of the channel thalweg. In general, it appears that if groundwater levels were maintained between the measurable objective and minimum threshold, this would result in groundwater levels typically lower than historical conditions (thus increasing depletions of interconnected surface water in excess of historical rates). However, the Plan does not provide an explanation for how the proposed sustainable management criteria will avoid a significant and unreasonable depletion of interconnected surface water, nor does it adequately evaluate how potential depletions associated with the minimum thresholds might affect beneficial uses and users of interconnected surface water. Department staff conclude that additional analysis should be conducted, and an explanation should be provided, to demonstrate how these thresholds will avoid an unreasonable depletion of surface water impacting beneficial uses and users. Also, consistent with previous recommendations, Department staff also recommend that the GSAs eliminate the non-drought year condition in the undesirable result definition and use fall (seasonal low) measurements in the evaluation of undesirable results (see [Recommended Corrective Action 7a](#)).

Department staff conclude that, at this time the GSP has not demonstrated, with adequate evidence, that the use of groundwater elevations as a proxy for depletions of interconnected surface water is sufficient to quantify the location, quantity, and timing of depletions, as required by GSP Regulations. Department staff encourage the GSA to re-evaluate both the monitoring network and sustainability criteria for interconnected surface water, to better align with the GSP Regulations, in the next periodic evaluation of the Plan.

Department staff understand that quantifying depletions of surface water from groundwater extractions is a complex task that likely requires developing new, specialized tools, models, and methods to understand local hydrogeologic conditions, interactions, and responses. During the initial review of GSPs, Department staff have observed that most GSAs have struggled with this new requirement of SGMA. However, staff believe that most GSAs will more fully comply with regulatory requirements after several years of Plan implementation that includes projects and management actions to address data gaps and other issues necessary to understand, quantify, and manage depletions of interconnected surface waters. Accordingly, Department staff believe that affording GSAs adequate time to refine their Plans to address interconnected surface waters is appropriate and remains consistent with SGMA's timelines and local control preferences.

The Department will continue to support GSAs in this regard by providing, as appropriate, financial and technical assistance to GSAs, including the development of guidance describing appropriate methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water caused by groundwater extractions. Once the Department's guidance related to depletions of interconnected surface water is publicly available, the GSA, where applicable, should consider incorporating appropriate guidance approaches into their future periodic updates to the GSP (See [Recommended Corrective Action 7b](#)). GSAs should consider availing themselves of the Department's

financial or technical assistance, but in any event must continue to fill data gaps, collect additional monitoring data, and implement strategies to better understand and manage depletions of interconnected surface water caused by groundwater extractions and define segments of interconnectivity and timing within their jurisdictional area (See [Recommended Corrective Action 7c](#)). Furthermore, GSAs should coordinate with local, state, and federal resources agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion (See [Recommended Corrective Action 7d](#)).

4.4 MONITORING NETWORK

The GSP Regulations describe the monitoring network that must be developed for each sustainability indicator including monitoring objectives, monitoring protocols, and data reporting requirements. Collecting monitoring data of sufficient quality and quantity is necessary for the successful implementation of a groundwater sustainability plan. The GSP Regulations require a monitoring network of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.³⁸⁰ Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,³⁸¹ monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,³⁸² capture seasonal low and high conditions,³⁸³ include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.³⁸⁴ Department staff encourage GSAs to collect monitoring data as specified in the GSP, follow SGMA data and reporting standards,³⁸⁵ fill data gaps identified in the GSP prior to the first periodic evaluation,³⁸⁶ update monitoring network information as needed, follow monitoring best management practices,³⁸⁷ and submit all monitoring data to the Department's Monitoring Network Module immediately after collection including any additional groundwater monitoring data that is collected within the Plan area that is used for groundwater management decisions. Department staff note that if GSAs do not fill their identified data gaps, the GSA's basin understanding may not represent the best available science for use to monitor basin conditions.

Groundwater Level Monitoring Network

The WMA Plan identifies 117 monitoring wells in the monitoring network for groundwater levels. Of the 117 wells in the groundwater level monitoring network, 74 wells are

³⁸⁰ 23 CCR § 354.32.

³⁸¹ 23 CCR § 354.34(b)(2).

³⁸² 23 CCR § 354.34(b)(3).

³⁸³ 23 CCR § 354.34(c)(1)(B).

³⁸⁴ 23 CCR §§ 354.34(g-h).

³⁸⁵ 23 CCR § 352.4 *et seq.*

³⁸⁶ 23 CCR § 354.38(d).

³⁸⁷ Department of Water Resources, 2016, [Best Management Practices and Guidance Documents](#).

identified as screened in the principal Upper Aquifer; 29 wells are identified as screened in the principal Lower Aquifer; and 14 wells are identified for monitoring groundwater in the Santa Ynez River Alluvium (underflow) subarea.³⁸⁸ There are 26 groundwater level representative monitoring sites, 13 in each of the principal aquifers.³⁸⁹ Department staff note that the representative monitoring sites match DWR's Monitoring Network Module on the SGMA Portal. Department staff determined the density of groundwater level monitoring wells exceeds the range (0.2 to 10 wells per 100 square miles) recommended by the Department's Best Management Practices.³⁹⁰

The proposed frequency for collecting groundwater level measurements varies by the collecting agency and includes monthly, semi-annual, and annual measurements.³⁹¹ The measurement frequency for representative monitoring wells is semi-annual (spring and fall).³⁹² Since the data collection frequency varies by agency, Department staff recommend that the WMA GSA update the Plan to include the timing and frequency of data collection for each groundwater level monitoring site by the next periodic evaluation.

The CMA Plan identifies 22 monitoring wells in the monitoring network for groundwater levels. Four of the wells are screened in the Buellton Aquifer, the only principal aquifer identified in the Plan area, and 18 are screened in the Santa Ynez River Alluvium.³⁹³ Department staff calculated the density of the four representative monitoring wells in the Buellton Aquifer to be equivalent to 18 wells per 100 square miles. While this exceeds the range (0.2 to 10 wells per 100 square miles) recommended by the Department's Best Management Practices,³⁹⁴ Department staff believe the inconsistent spatial distribution of the monitoring sites is not sufficient to adequately characterize groundwater conditions across the Buellton Aquifer.³⁹⁵ Two of the representative monitoring wells are located in the far western portion of the Plan area and the remaining two representative monitoring wells are located approximately 5 miles to the east in the City of Buellton, leaving most of the Buellton Aquifer without any groundwater level monitoring. The Plan states that there is not enough groundwater level data for the Buellton Aquifer to create contour maps³⁹⁶ and recognizes the limited number of monitoring sites as a data gap in the HCM.³⁹⁷ Department staff suggest the CMA GSA continue to work towards resolving the groundwater level monitoring data gap in the Buellton Aquifer by the next periodic evaluation.

³⁸⁸ Santa Ynez River Valley Western Management Area GSP, Table 3a.2-1, p. 509.

³⁸⁹ Santa Ynez River Valley Western Management Area GSP, Table 3a.3-1, pp. 527-528, Figure 3a.3-1, p. 529.

³⁹⁰ Department of Water Resources, 2016, [Monitoring Networks and Identification of Data Gaps BMP](#).

³⁹¹ Santa Ynez River Valley Western Management Area GSP, Table 3a.2-1, p. 509.

³⁹² Santa Ynez River Valley Western Management Area GSP, Section 3b.2-1, p. 552.

³⁹³ Santa Ynez River Valley Central Management Area GSP, Table 3a.2-1, p. 455.

³⁹⁴ Department of Water Resources, 2016, [Monitoring Networks and Identification of Data Gaps BMP](#).

³⁹⁵ 23 CCR §§ 354.34(c)(1)(A-B) & (c)(2).

³⁹⁶ Santa Ynez River Valley Central Management Area GSP, Section 2b1-2-1, p. 288.

³⁹⁷ Santa Ynez River Valley Central Management Area GSP, Section 2a.5-2, p. 282.

The proposed frequency for collecting groundwater level measurements in the monitoring network varies by the collecting agency and includes monthly, semi-annual, and annual measurements.³⁹⁸ The measurement frequency for representative monitoring wells is semiannually, occurring in the spring and fall.³⁹⁹ Department staff encourage the CMA GSA to update the Plan to include the timing and frequency of each monitoring site by the next periodic evaluation.

The EMA Plan identifies 24 representative monitoring wells in the Plan area for the monitoring of groundwater levels.⁴⁰⁰ Of the 24 wells in the monitoring network, 15 wells are identified as screened in the Paso Robles Formation principal aquifer, and nine wells are identified as screened in the underlying Careaga Sand principal aquifer.⁴⁰¹ The calculated well density of the monitoring networks is 10 wells and six wells per 100 square miles for the Paso Robles Formation and the Careaga Sand Formation, respectively.⁴⁰² The density of groundwater level monitoring wells exceeds the range recommended by the Department's Best Management Practices.⁴⁰³

The proposed frequency for collecting groundwater levels is semi-annually in the spring and fall.⁴⁰⁴ Department staff recommend that the GSA update the Plan to include the timing and frequency of each monitoring site. Additionally, the Plan describes fall measurement collection as a historical data gap to be addressed.⁴⁰⁵ Department staff agree with this and recommend the GSA clearly describe and identify the wells that are monitored each spring and fall by the next periodic evaluation.

Groundwater Storage Monitoring Network

Each of the three Plans proposes to use the groundwater level monitoring network as a proxy for the groundwater storage monitoring network, based on the understanding that changes in groundwater storage are directly dependent on changes in groundwater levels.⁴⁰⁶ Since the GSA intends to use the same groundwater level network, Department staff reiterate that the spatial distribution of the monitoring network in the CMA is likely insufficient for monitoring changes in storage in the Buellton Aquifer. Therefore, Department staff suggest the CMA GSA continue to work towards resolving the groundwater level monitoring data gap in the Buellton Aquifer by the next periodic evaluation.

³⁹⁸ Santa Ynez River Valley Central Management Area GSP, Table 3a.2-1, p. 456.

³⁹⁹ Santa Ynez River Valley Central Management Area GSP, Table 3a.3-2, p. 471, Section 3b.2-1, p. 497.

⁴⁰⁰ Santa Ynez River Valley Eastern Management Area GSP, Table 4-2, pp. 281-282, Section 4.3, pp. 278-280, Figure 4-1, p. 283, Section 4.9, p. 316.

⁴⁰¹ Santa Ynez River Valley Eastern Management Area GSP, Section 4.3, p. 280.

⁴⁰² Santa Ynez River Valley Eastern Management Area GSP, Section 4.3.2, p. 286.

⁴⁰³ Department of Water Resources, 2016, [Monitoring Networks and Identification of Data Gaps BMP](#).

⁴⁰⁴ Santa Ynez River Valley Eastern Management Area GSP, Executive Summary, p. 40; Table 4-3, p. 287.

⁴⁰⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 3.1.5.1, p. 147.

⁴⁰⁶ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-2, p. 517; Santa Ynez River Valley Central Management Area GSP, Section 3a.2-2, p. 460; Santa Ynez River Valley Eastern Management Area GSP, Section 4.4, p. 291.

Seawater Intrusion Monitoring Network

In two of the three plans, CMA⁴⁰⁷ and EMA⁴⁰⁸, the GSAs indicate that the seawater intrusion sustainability indicator is not applicable to the Plan area. Department staff agree that seawater intrusion is not occurring and is not likely to occur in these two Plan areas in the future.

As discussed in Section 4.2.2 ([Groundwater Conditions](#)), the Upper Aquifer in the WMA is in contact with the Pacific Ocean.⁴⁰⁹ The Plan provides a figure depicting the location of recent chloride isocontour lines in the WMA. The 500 mg/L contour, which represents the minimum threshold, is shown to be near the eastern boundary of the Santa Ynez River Estuary.⁴¹⁰

The WMA Plan explains that a subset of two wells (17K20 and 26F4) from the existing groundwater quality monitoring network will be used to monitor for seawater intrusion.⁴¹¹ However, across different sections of the Plan, the precise identification, quantity, and locations of monitoring sites is inconsistent or unclear. For example, Table 3a.3-1, which lists all the representative monitoring sites in the WMA, identifies two sites for seawater intrusion monitoring (17K20 and 21G2).⁴¹² The Plan also provides a seawater intrusion monitoring network map that shows four sites, with the two additional sites (22A3 and 27F1) located in the vicinity of the 500 mg/L chloride isocontour.⁴¹³ In the sustainable management criteria section of the GSP, the Plan also identifies two additional wells (17M1 and 22A1) that will be used to track seawater intrusion further inland.⁴¹⁴ Due to these discrepancies, Department staff cannot determine the true representative monitoring sites. Therefore, staff encourage the WMA GSA to revise the Plan, throughout, to explicitly and consistently identify the intended seawater intrusion representative and non-representative monitoring sites.

Moreover, the WMA Plan does not clearly identify the frequency of measurements for each well in the seawater intrusion monitoring network. As mentioned in the Plan, the monitoring frequency for the USGS monitoring network, which appears may include wells used by the GSA to track seawater intrusion, ranges from annually to triennially. While the GSA states that it intends to measure monitoring sites annually to update the chloride minimum threshold isocontour, it does not specify which sites it intends to monitor annually for this purpose or at what time of year this will occur.⁴¹⁵ Given the range of

⁴⁰⁷ Santa Ynez River Valley Central Management Area GSP, Section 2b.4, p. 349, Section 3a, p. 452, Section 3b.2-3, p. 500.

⁴⁰⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 3.2, p. 150, Section 4.2.1, p. 277, Section 4.5, p. 294.

⁴⁰⁹ Santa Ynez River Valley Western Management Area GSP, Figure 2b.4-4, p. 389.

⁴¹⁰ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-4, p. 518, Figure 2b.4-3, p. 387.

⁴¹¹ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-4, p. 518.

⁴¹² Santa Ynez River Valley Western Management Area GSP, Table 3a.3-1, pp. 527-528.

⁴¹³ Santa Ynez River Valley Western Management Area GSP, Figure 3a.3-3, p. 535.

⁴¹⁴ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-3, p. 591.

⁴¹⁵ Santa Ynez River Valley Western Management Area GSP, Section 3b.3-3, p. 591.

monitoring frequencies and limited (and unclear) number of monitoring sites, Department staff are unsure if the network is sufficient to detect changes in seawater intrusion early enough for the GSA to respond with management actions to avoid undesirable results. For these reasons, Department staff conclude that the Plan should clearly define the monitoring frequency for each site. By the next periodic evaluation of the Plan, Department staff suggest the GSA create a table to clearly identify seawater intrusion monitoring sites depicting the measurement frequency and timing of each site.

Groundwater Quality Monitoring Network

The WMA and CMA GSPs propose to use groundwater quality data from three existing monitoring programs, a USGS monitoring program; agricultural wells as part of the Central Coast Water Quality Control Board's Irrigated Lands Regulatory Program; and public supply wells as reported to the United States Environmental Protection Agency's Safe Drinking Water Information System and the SWRCB Division of Drinking Water. The Plan notes that these datasets are publicly available on the SWRCB GAMA website.⁴¹⁶ The WMA and CMA GSPs identify six constituents of concern with established sustainable management criteria (TDS, chloride, sulfate, boron, sodium, and total nitrogen) that they will be monitoring for.

The monitoring well locations, and associated monitoring program for each site, are shown on Figure 3a.2-2.⁴¹⁷ Table 3a.2-3 shows the number of wells in each monitoring program, the frequency of monitoring, and the aquifer that is monitored.⁴¹⁸ The Plan also discusses the frequency of monitoring based on the constituent.⁴¹⁹

The EMA Plan proposes to use groundwater quality data from existing monitoring programs as well. The Plan includes 61 wells in the groundwater quality monitoring network.⁴²⁰ The Plan states that 26 of these are municipal and public water system wells screened in one of the two principal aquifers that were sampled for at least one of the constituents of concern since 2015.⁴²¹ However, despite stating that the wells are screened in a principal aquifer, Department staff note that 58 of the 61 sites listed on Table 4-4 are characterized as having an "unknown" aquifer designation and many wells are missing critical construction information required by the GSP Regulations, such as depth of well and screen interval information.⁴²² Department staff suggest the EMA GSA

⁴¹⁶ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-3, pp. 517-518; Santa Ynez River Valley Central Management Area GSP Section 3a.2-3, pp. 460-465.

⁴¹⁷ Santa Ynez River Valley Western Management Area GSP, Figure 3a.2-2, p. 519; Santa Ynez River Valley Central Management Area GSP, Figure 3a.2-2, p. 461.

⁴¹⁸ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-3, pp. 517-518, Table 3a.2-3, p. 518; Santa Ynez River Valley Central Management Area GSP, Section 3a.2-3, p. 460, Table 3a.2-3, p. 465.

⁴¹⁹ Santa Ynez River Valley Western Management Area GSP, Section 1d.5-3, p. 147; Santa Ynez River Valley Central Management Area GSP, Section 1d.5-3, pp. 134-135.

⁴²⁰ Santa Ynez River Valley Eastern Management Area GSP, Table 4-4, pp. 298-301.

⁴²¹ Santa Ynez River Valley Eastern Management Area GSP, Section 4.6, p. 296-297.

⁴²² Santa Ynez River Valley Eastern Management Area GSP, Table 4-4, pp. 298-301.

develop a plan to fill the well parameter data gap and include the aquifers being monitored by the next periodic evaluation.

The EMA GSP identifies the same constituents of concern as the WMA and CMA (TDS, chloride, sulfate, boron, sodium, and total nitrogen). The Plan includes a map depicting the groundwater quality network well locations and well type.⁴²³ Aside from wells that are in the Irrigated Lands Regulatory Program,⁴²⁴ the sampling frequency for the water quality monitoring network is not discussed in the Plan. Department staff suggest the EMA GSA update the Plan to include the specific frequency of the water quality monitoring network by the next periodic evaluation.

Subsidence Monitoring Network

The three GSPs state that InSAR data will be used in addition to continuous GPS stations to monitor subsidence. The WMA⁴²⁵ and CMA⁴²⁶ Plans will each use a single continuous GPS station for this purpose (each with a station within their respective plan area). The EMA will use three continuous GPS sites for this purpose — two sites located outside the Plan area (and Basin) and one site within the Plan area.⁴²⁷ However, the Plans do not provide the timing or frequency with which the data from InSAR or the continuous GPS stations will be analyzed. The GSAs for the three Plan areas should coordinate and adopt a clear protocol for when these data will be collected and analyzed.

Interconnected Surface Water Monitoring Network

WMA GSA proposes to use a combination of stream gauges and groundwater level sites to monitor surface water flows and depletions of interconnected surface water, respectively. The Plan identifies three stream gauges with two currently on the Santa Ynez River and the third outside the Basin on the Salsipuedes Creek.⁴²⁸ The Plan notes that the Santa Ynez River flows perennially downstream of the discharge from the Lompoc Regional Wastewater Treatment Plant to the Santa Ynez River estuary and Pacific Ocean.⁴²⁹ The Plan indicates that a stream gauge is proposed near the mouth to the Santa Ynez River to increase the GSAs' understanding of total outflow of the River (which is identified as a data gap).⁴³⁰ Department staff note that there is a project for

⁴²³ Santa Ynez River Valley Eastern Management Area GSP, Figure 4-3, p. 302.

⁴²⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 4.6, p. 296.

⁴²⁵ Santa Ynez River Valley Western Management Area GSP, Section 3a.2-5, p. 521, Section 3a.3-5, p. 532, Figure 3a.2-3, p. 523.

⁴²⁶ Santa Ynez River Valley Central Management Area GSP, Section 3a.2-5, pp. 465-466, Section 3a.3-5, p. 477, Figure 2b.5-1, p. 353.

⁴²⁷ Santa Ynez River Valley Eastern Management Area GSP, Figure 3-33, p. 182, Section 3.2.4, pp. 180-184.

⁴²⁸ Santa Ynez River Valley Western Management Area GSP, Figure 3a.3-5, p. 541.

⁴²⁹ Santa Ynez River Valley Western Management Area GSP, Section 2a.4-5-1, p. 293.

⁴³⁰ Santa Ynez River Valley Western Management Area GSP, Section 3a.3-6, p. 540.

installing this new gauge near the mouth of the River in the WMA GSP's "Plan Implementation" section.⁴³¹

The WMA GSP states that groundwater level data will be used as a proxy to "evaluate potential Surface Water Depletions and potential impacts to Groundwater Dependent Ecosystems."⁴³² Depletion of interconnected surface water and groundwater will be quantified by measuring groundwater elevations semi-annually at three representative monitoring points located adjacent to the Santa Ynez River.⁴³³ While minimum thresholds and measurable objectives for water levels in the WMA (and CMA) are set in consideration of the channel thalweg, the Plan is missing details on how they will be used to determine the depletion of surface water.

The CMA does discuss the use of a numerical model to estimate depletions of interconnected surface water. However, it appears the model is not yet functional because there are data gaps in monitoring groundwater levels and stream gauges.⁴³⁴ The CMA monitors surface water flows and interconnected surface water depletions via a combination of stream gauges and groundwater levels as a proxy for interconnected surface water depletions.

The CMA is planning to use three active stream gauges operated by the USGS; however, they are not located in the Plan area. Two of the gauges are found along the Santa Ynez River (one is located approximately one mile upstream from the CMA Plan area within the EMA Plan area and the second is located 12 miles downstream from the CMA Plan area within the WMA Plan area). The third gauge is located outside the Plan area on the tributary Zaca Creek that flows into the Plan area from the north and ultimately drains into the Santa Ynez River.⁴³⁵ The GSA considers the downstream gauge a data gap and is proposing to take spot flow measurements of the surface water outflow from the CMA area for a period of one year to develop a correlation with the gauge. Department staff note the WMA GSA should consider activating the USGS gauge (11131000) which is on the western border of the Plan area.

The CMA Plan provides a map showing the location of three representative monitoring wells and other monitoring locations simply referred to as "existing monitoring sites."⁴³⁶ The Plan does not include any details on two of the three representative monitoring wells (i.e., well depth, screening, etc.). Figure 3a.3-3 also shows the spatial relationship between wells and potential GDEs and depicts the general location of a proposed

⁴³¹ Santa Ynez River Valley Western Management Area GSP, Section 5a.2-4, p. 662.

⁴³² Santa Ynez River Valley Western Management Area GSP, Section 3a.3-6, p. 539.

⁴³³ Santa Ynez River Valley Western Management Area GSP, Section 3b.2-6, p. 576.

⁴³⁴ Santa Ynez River Valley Western Management Area GSP, Section 3a.3-6, p. 478.

⁴³⁵ Santa Ynez River Valley Central Management Area GSP, Figure 2b.6-1, p. 359.

⁴³⁶ Santa Ynez River Valley Central Management Area GSP, Figure 3a.3-3, p. 479.

piezometer that will be used to evaluate GDEs along the Santa Rosa Creek (a current data gap noted in the Plan).⁴³⁷

The EMA takes a similar approach using groundwater levels as a proxy for depletion of interconnected surface waters. The GSA intends to install two representative monitoring wells at the confluences of the Alamo Pintado and Zanja de Cota Creeks with the Santa Ynez River, which is also the general location of existing GDEs.⁴³⁸ The Plan explains that groundwater elevations near the potential GDEs will be used as a proxy for the depletion of interconnected surface water sustainability indicator.⁴³⁹ Department staff find the monitoring of groundwater levels in the vicinity of the GDEs (beneficial users of groundwater) to be reasonable; however, believe the GSA has not provided sufficient evidence to demonstrate that these two monitoring wells will satisfy all of the requirements from the GSP Regulations regarding the monitoring of depletions of interconnected surface water, especially for the Santa Ynez River.

The Plan states that “[d]iversions from the Santa Ynez River alluvium are regulated by the SWRCB because it is considered underflow associated with the Santa Ynez River. Therefore, the EMA GSA will not be responsible for managing any aspect of the Santa Ynez River.”⁴⁴⁰ As discussed above in the Basin Coverage section (Section 3.3), whether the SWRCB or the GSAs have jurisdiction and will manage this area is uncertain and appears largely to be a legal issue. Department staff cannot resolve this issue but have included a recommended corrective action that the GSAs implement their proposed program to address data gaps and ensure that data regarding this area will be incorporated into Basin management. However, separate from this issue, Department staff believe that the EMA GSA has not fully assessed the impacts to the River from groundwater extractions occurring in the Paso Robles Formation aquifer (which is hydrologically connected, and discharges to the to the River, via tributaries as surface flows and underflows). Staff note that there is a significant number of domestic,⁴⁴¹ agricultural,⁴⁴² and urban⁴⁴³ wells within the Older Alluvium and Paso Robles Formation. As a result, the EMA GSA should establish monitoring approaches that would gather data to support the depletions of interconnected surface water resulting from extractions in the principal aquifer.

Each of the Plans omitted required details such as well construction information, aquifers being monitored by well, and specific frequencies and timing of monitoring. There are also gaps in monitoring that, unless resolved, will likely impact the GSAs’ hydrogeologic conceptual models, understanding of groundwater conditions, water budgets, and ability

⁴³⁷ Santa Ynez River Valley Central Management Area GSP, Figure 3a.3-3, p. 479.

⁴³⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 4.8, p. 313, Figure 4-4, p. 314.

⁴³⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 4.8, p. 313.

⁴⁴⁰ Santa Ynez River Valley Eastern Management Area GSP, Section 4.8, p. 312.

⁴⁴¹ Santa Ynez River Valley Eastern Management Area GSP, Figure 2-8, p. 76.

⁴⁴² Santa Ynez River Valley Eastern Management Area GSP, Figure 2-9, p. 77.

⁴⁴³ Santa Ynez River Valley Eastern Management Area GSP, Figure 2-10, p. 78

to detect and avoid undesirable results. However, Department staff consider these issues relatively easy to resolve and, therefore, do not believe they should preclude Plan approval, provided the GSAs implement plans to resolve these issues by the next periodic evaluation.

4.5 PROJECTS AND MANAGEMENT ACTIONS

The GSP Regulations require a description of the projects and management actions the submitting Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.⁴⁴⁴ Each Plan's description of projects and management actions must include details such as: how projects and management actions in the GSP will achieve sustainability, the implementation process and expected benefits, and prioritization and criteria used to initiate projects and management actions.⁴⁴⁵

The three GSPs offer a host of project and management actions that target demand reduction, increased groundwater or surface water supply, filling data gaps, improving groundwater quality, and possibly implementing a credit or trading program.

Project and management actions are planned for the WMA and CMA to address drought-related declining groundwater level trends and to achieve a net gain of approximately 500 AFY (WMA) and 200 AFY (CMA) in the water budget. Otherwise, the Plans indicate that groundwater storage could continue to decline by 500 AF or 200 AF each year (based on 2018 demands)⁴⁴⁶, and water levels in some monitoring sites may fall beneath their minimum thresholds. Similarly, additional projects and management actions are identified to adaptively address possible changes in water demand and climate changes to achieve a potential net gain of up to 3,000 AFY (WMA) and 600 AFY (CMA) in the water budget by the year 2072.⁴⁴⁷ The EMA does not provide specific quantitative benefits it hopes to achieve from its projects and management actions.

The three Plans organized their projects and management actions into multiple groups. WMA and CMA have four similar groups, EMA has three. Each of the GSAs intends to implement all "Group 1" (general management) activities early during GSP implementation. Regarding the other groups, the WMA and CMA identify "Group 2" as actions that can be implemented if groundwater conditions begin to approach minimum thresholds; "Group 3" actions can be implemented if minimum thresholds are exceeded; and finally, "Group 4" actions can be implemented if the prior group actions are insufficient to maintain the sustainability goal for the Basin.⁴⁴⁸ The Plan explains that EMA Group 2

⁴⁴⁴ 23 CCR § 354.44 (a).

⁴⁴⁵ 23 CCR § 354.44 (b) *et seq.*

⁴⁴⁶ Santa Ynez River Valley Western Management Area GSP, Table 2c.5-3, p. 497.

⁴⁴⁷ Santa Ynez River Valley Western Management Area GSP, Section 4a, p. 609; Santa Ynez River Valley Central Management Area GSP, Section 4a, p. 533.

⁴⁴⁸ Santa Ynez River Valley Western Management Area GSP, Section 4a, pp. 610-611; Santa Ynez River Valley Central Management Area GSP, Section 4a, pp. 534-435.

and 3 actions will be implemented if Group 1 activities do not make sufficient progress toward sustainability goals.

The three GSPs intend to implement group 1 actions right after GSP adoption. This group includes the following demand reduction projects: developing voluntary or rebate-incentivized conservation efforts for municipal, agricultural, and domestic uses to augment existing conservation efforts in the WMA ⁴⁴⁹ and in the CMA, ⁴⁵⁰ and implementation of water use efficiency programs in the EMA.⁴⁵¹ The WMA and CMA predict that the benefit from conservation will be a reduction of approximately 10-20% (2,000 to 4,000 AFY) and 10-30% (300 to 900 AFY) from current groundwater production in the WMA and CMA, respectively, when implemented in conjunction with another demand reduction effort imposing extraction fees with mandatory well metering and well registration.⁴⁵² The EMA GSA estimates a benefit of approximately 1,450 AFY from its water efficiency program, based on the assumption of an EMA-wide 10 percent pumping reduction.⁴⁵³ The EMA is exploring a pumping fee structure that the GSA hopes will encourage reduction in extractions by an estimated 725 AFY.⁴⁵⁴ Combined, the demand reduction from the three Plans is projected to be in the approximate range of 4,500-7,000 AFY.

The WMA Plan is proposing supply enhancements via the increased use of recycled water that could result in up to an approximate 3,800 AFY reduction in groundwater pumping. Both WMA and CMA also propose to increase stormwater recharge. WMA expects the benefit from this to be approximately 170 AFY⁴⁵⁵ while CMA estimates a benefit of approximately 20 AFY.⁴⁵⁶

The remaining Group 1 actions in the WMA Plan area includes a ban on self-regenerating water softeners with the expectation that this effort will significantly improve groundwater quality by reducing TDS, chloride, and sodium loads in groundwater.⁴⁵⁷ The EMA GSA has an action to address data gaps that includes installing monitoring wells, updating cropping factors to improve the water budget, refining the hydrogeologic conceptual model, and improving its understanding of groundwater conditions.⁴⁵⁸ A well registration and well meter installation program is planned in the EMA to better understand water

⁴⁴⁹ Santa Ynez River Valley Western Management Area GSP, Section 4B.1-1, pp. 619-621.

⁴⁵⁰ Santa Ynez River Valley Central Management Area GSP, Section 4B.1-1, pp. 543-545.

⁴⁵¹ Santa Ynez River Valley Eastern Management Area GSP, Section 6.6, pp. 421-428.

⁴⁵² Santa Ynez River Valley Central Management Area GSP, Section 4B.2-1, pp. 549-550; Santa Ynez River Valley Western Management Area GSP, Section 4B.2-1, pp. 625-626.

⁴⁵³ Santa Ynez River Valley Eastern Management Area GSP, Section 6.6.7, p. 426.

⁴⁵⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 6.4.7, p. 412.

⁴⁵⁵ Santa Ynez River Valley Western Management Area GSP, Section 4B.4-2, p. 635.

⁴⁵⁶ Santa Ynez River Valley Central Management Area GSP, Section 4B.4-2, p. 557.

⁴⁵⁷ Santa Ynez River Valley Western Management Area GSP, Section 4B.5-2, p. 638.

⁴⁵⁸ Santa Ynez River Valley Eastern Management Area GSP, Section 6.3.9, p. 404.

usage, refine the hydrogeologic conceptual model and water budget, and encourage pumping reduction from users.⁴⁵⁹

The WMA and CMA Group 2 actions include situational water rights releases and imposing conditions on new wells. If early warning triggers are exceeded, the GSA may request releases of water from the Cachuma reservoir under the “Below Narrows Account” water rights.⁴⁶⁰ Department staff are concerned that releases under this water right may only generate temporary relief from exceedances of early warning triggers rather than mitigate any potential overdraft. The Plan does not explain how the GSAs and Santa Ynez Water Conservation District intend to manage water under this water right to ensure there will be water available for releases when early warning triggers are exceeded again.

The WMA and CMA GSAs propose to implement ordinances limiting groundwater extraction from new wells if early warning triggers (within five feet of the minimum thresholds) are exceeded in more than 50% of the representative monitoring sites.⁴⁶¹ The benefit from this management action in the WMA and CMA is estimated at 50-500 AFY and 20-200 AFY, respectively.⁴⁶² However, this benefit is dependent on the expected number of new wells.

The EMA Group 2 actions include implementation of a groundwater pumping allocation program to equitably allocate a groundwater volume of water to be pumped annually,⁴⁶³ a groundwater extraction credit marketing and trading program to provide extractors with flexibility in using their pumping allocation,⁴⁶⁴ and finally a crop fallowing and crop conversion program to preserve water rights for producers that choose to fallow or convert lands and reduce groundwater extraction.⁴⁶⁵

The WMA and CMA Group 3 action includes implementing an annual pumping allocation plan. The GSAs may implement annual pumping allocations if Group 1 and 2 projects and management actions are not implemented or do not achieve the expected results of maintaining groundwater production within the sustainable yield or if minim thresholds are exceeded.⁴⁶⁶ The EMA projects in group 3 focus on augmenting supplies in the EMA.⁴⁶⁷ These projects include distributed stormwater managed aquifer recharge; recycled water and reuse projects; a precipitation enhancement program; conjunctive use - MAR projects using supplemental (State Water Project and Santa Ynez River) water; in lieu recharge projects to deliver unused and surplus supplemental water to offset groundwater

⁴⁵⁹ Santa Ynez River Valley Eastern Management Area GSP, Section 6.5, pp. 414-420.

⁴⁶⁰ Santa Ynez River Valley Western Management Area GSP, Section 4C.1-1, p. 642.

⁴⁶¹ Santa Ynez River Valley Western Management Area GSP, Sections 4C.2-1 through 4C.2-2, p. 644.

⁴⁶² Santa Ynez River Valley Western Management Area GSP, Table 4a.1-2, p. 615.

⁴⁶³ Santa Ynez River Valley Eastern Management Area GSP, Section 6.7, pp. 428-435.

⁴⁶⁴ Santa Ynez River Valley Eastern Management Area GSP, Section 6.8, pp. 435-442.

⁴⁶⁵ Santa Ynez River Valley Eastern Management Area GSP, Section 6.9, pp. 442-449.

⁴⁶⁶ Santa Ynez River Valley Central Management Area GSP, Section 4C, p. 561, Section 4C.3-1, p. 566.

⁴⁶⁷ Santa Ynez River Valley Eastern Management Area GSP, Section 6.10, pp. 449-457.

extractions; and aquifer storage and recovery projects. The direct benefits from these projects are not provided because the GSP currently has no plan to initiate them.

The WMA and CMA Group 4 actions list several “supply” and “demand” related supplemental projects and management actions that could be implemented in the future; however, limited information is provided for these actions as they are not currently be considered by the GSAs.⁴⁶⁸

For each of the projects and management actions in groups 1-3, the Plans present the necessary information required by the GSP Regulations including their description, potential benefits to measurable objectives and overdraft mitigation, justification, implementation triggers, cost and funding, relevant permitting and regulatory processes, public notice process, implementation process and timetable, and legal authority.

4.6 CONSIDERATION OF ADJACENT BASINS/SUBBASINS

SGMA requires the Department to “...evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin.”⁴⁶⁹ Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP be designed to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.⁴⁷⁰

The WMA Plan area is adjacent to the San Antonio Creek Valley Groundwater Basin.⁴⁷¹ The Basin is bounded to the north by the Purisima Hills and Purisima Anticline, which limits connectivity between the principal aquifers in the WMA and the San Antonio Creek Valley Groundwater Basin.⁴⁷² It is noted that the Vandenberg Space Force base has a State Water Project allocation of up to 6,050 AFY. However, the GSP reports that recent reductions in deliveries during the dry period from 2011 to 2018 resulted in the Vandenberg Space Force base only receiving approximately 1,600 AFY. To augment the reduced surface water supply, the Vandenberg Space Force base pumped from the adjacent San Antonio Creek Valley Groundwater Basin.⁴⁷³ Review of the current water budget has identified the approximate 1,600 AFY in the surface inflows.⁴⁷⁴ However, there does not appear to be an accounting of the groundwater pumped in the adjacent San Antonio Creek Valley Basin that may have been used in the Santa Ynez River Valley Basin. Department staff recommend the GSA account for this water in future water budgets if groundwater from the San Antonio Creek Valley is being used within the Basin.

⁴⁶⁸ Santa Ynez River Valley Western Management Area GSP, Sections 4D, pp. 651-652; Santa Ynez River Valley Central Management Area GSP, Sections 4D, p. 570.

⁴⁶⁹ Water Code § 10733(c).

⁴⁷⁰ 23 CCR § 354.28(b)(3).

⁴⁷¹ Santa Ynez River Valley Western Management Area GSP, Figure 1a.1-2, p. 69

⁴⁷² Santa Ynez River Valley Western Management Area GSP, Section 3b.6, p. 607.

⁴⁷³ Santa Ynez River Valley Eastern Management Area GSP, Section 2c.3-4, p. 480.

⁴⁷⁴ Santa Ynez River Valley Western Management Area GSP, Table 2c.4-1, p. 482.

The CMA Plan area does not have any hydrologic connection to the San Antonio Creek Valley Groundwater Basin or any other basin.

The EMA Plan area is adjacent to the San Antonio Creek Valley Basin.⁴⁷⁵ In the Plan's discussion on the effects of minimum thresholds on the San Antonio Creek Valley Basin, the EMA GSA claims that there is no hydrologic connection between the two areas but further later clarifies that groundwater gradients at the boundary indicate that groundwater does not flow between the areas. However, this assessment is based on limited available information. The GSA does acknowledge that if production wells are in proximity of the boundary, then it may be possible the gradient can change in either direction.⁴⁷⁶ Department staff agree with the GSA that additional monitoring wells may be needed along the boundary to increase the understanding of the connectivity between the basins and to monitor for potential impacts related to pumping and GSP implementation.

Department staff conclude that the Plan substantially addressed the GSP Regulations for this section. Department staff will continue to review Periodic Evaluations of the Plan to assess whether implementation of the Plan is potentially impacting the adjacent basin.

4.7 CONSIDERATION OF CLIMATE CHANGE AND FUTURE CONDITIONS

The GSP Regulations require a GSA to consider future conditions and project how future water use may change due to multiple factors including climate change.⁴⁷⁷

Since the GSP was adopted and submitted, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, drier conditions will result in a loss of 10% of California's water supply. As California adapts to a hotter, drier climate, GSAs should be preparing for these changing conditions as they work to sustainably manage groundwater within their jurisdictional areas. Specifically, the Department encourages GSAs to:

1. Explore how their proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the basin based on current and future drought conditions.
2. Explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought.
3. Take into consideration changes to surface water reliability and that impact on groundwater conditions.
4. Evaluate updated watershed studies that may modify assumed frequency and magnitude of recharge projects, if applicable, and

⁴⁷⁵ Santa Ynez River Valley Central Management Area GSP, Figure 1-1, p. 54.

⁴⁷⁶ Santa Ynez River Valley Eastern Management Area GSP, Section 5.5.2.4, p. 345.

⁴⁷⁷ 23 CCR § 354.18.

5. Continually coordinate with the appropriate groundwater users, including but not limited to domestic well owners and state small water systems, and the appropriate overlying county jurisdictions developing drought plans and establishing local drought task forces to evaluate how their Plan's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

5 STAFF RECOMMENDATION

Department staff recommend approval of the GSP with the recommended corrective actions listed below. The Santa Ynez River Valley Basin GSP conforms with Water Code Sections 10727.2 and 10727.4 of SGMA and substantially complies with the GSP Regulations. At this time, it appears that implementation of the GSP will likely achieve the sustainability goal for the Santa Ynez River Valley Basin. The GSAs have identified several areas for improvement of their Plans and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified additional recommended corrective actions that should be considered by the GSAs for the first periodic assessment of the GSPs.

These recommended corrective actions apply to all three of the GSPs in the Basin (unless otherwise stated) and should be addressed in a coordinated manner. Addressing these recommended corrective actions will be important to demonstrate that implementation of the Plan is likely to achieve the sustainability goal for the Basin consistent with SGMA timeframes. The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

In response to a series of meetings between the GSAs, the Department, and the State Water Board regarding the management of water pumped from the Santa Ynez River Alluvium, the GSAs prepared and transmitted an action plan via the Department's SGMA Portal titled *Action Plan for Management of All Well Production Along the Lower Santa Ynez River, Above the Lompoc Narrows*. Department staff recommend incorporating the action plan (as described in the GSAs' January 5, 2024, letter) into the Plan for the Basin and document the implementation of the action plan in future periodic evaluations of the Plan. The Department will track progress through review of annual reports and periodic evaluations.

RECOMMENDED CORRECTIVE ACTION 2

Provide additional analysis and description that more clearly delineates the physical properties of the principal aquifers and the physical relationship of the Santa Ynez River Alluvium with those principal aquifers. The analysis and description should indicate improved understanding of the hydrogeologic contact, lateral flow, and vertical flow of groundwater between the principal aquifers, the river alluvium, and various surface

streams – including tributaries – in the entire Basin. This analysis should inform the GSA's continued effort to understand interconnected surface water and the approach to manage depletions of interconnected surface water due to pumping.

RECOMMENDED CORRECTIVE ACTION 3

The GSAs need to reevaluate the water budgets for consistency:

- a. Collectively, in the coordination agreement or otherwise, collaboratively and consistently assess the Basin's hydrologic conditions, develop consistent groundwater inflows and outflows, assess associated data gaps effecting the water budget (like groundwater level information), and refine the water budgets to show how projected GSA projects and management actions will improve the current and projected groundwater deficits. This assessment should be conducted for the Basin as a whole, and not just the individual management areas.
- b. Adopt and employ consistent time periods, methods, terminologies, and definitions for the various physical components of the Basin that inform the Basin-wide water budget including the sustainable yield and groundwater change in storage. For example, the GSAs should collectively use the same time periods for the development of their sustainable yields and should clearly explain how releases from Lake Cachuma are managed to effectively regulate the surface water and groundwater system through each of the three management areas.

RECOMMENDED CORRECTIVE ACTION 4

The GSAs need to reevaluate the sustainable management criteria for the chronic lowering of water levels and address the following items:

- a. Revise the definition of undesirable results and language pertaining to significant and unreasonable chronic lowering of groundwater levels to remove the non-drought year condition and discuss how extractions and recharge will be managed as necessary to ensure that reductions in groundwater levels or storage during dry years are offset by increases in groundwater levels or storage during other years within the sustainable management criteria for the chronic lowering of groundwater levels.
- b. Revise the sustainable management criteria to be based on seasonal low groundwater levels to ensure potential impacts to beneficial uses and users are considered.
- c. Through a well impact analysis, describe where the proposed minimum thresholds are set relative to well construction information that would indicate whether or not more substantial impacts to beneficial users are occurring. This assessment should include evaluating how the sustainable management criteria may affect production wells relative to the depth of pump intake, bottom of the screen interval, and well dewatering, as applicable. This information should be clearly reported in

the Plan for the entire Basin including quantities of wells that may be impacted and the approximate locations of where any potential impacts may occur.

RECOMMENDED CORRECTIVE ACTION 5

The GSAs need to reevaluate the sustainable management criteria for water quality and address the following items:

- a. The EMA GSP should reevaluate the quantitative definition of undesirable results related to degradation of water quality. The quantitative definition of an undesirable result should incorporate a combination of minimum threshold exceedances, similar to the WMA GSP and CMA GSP, and clearly explain how that quantitative criteria represents significant and unreasonable conditions occurring throughout the management area and Basin.
- b. Provide an assessment of when and how GSA activities may impact water quality and how the GSAs will discern whether or not the increased degradation of water quality is distinct from the “other causes of increase salt and nutrients” as noted in the Plan.
- c. Similar to the chronic lowering of groundwater levels sustainable management criteria and other sustainability indicators, the GSAs should not include water year type criteria when defining undesirable results. The GSAs should revise the definition of undesirable results and language pertaining to significant and unreasonable degradation of water quality to remove the non-drought year condition.
- d. Clearly convey the minimum threshold values for each representative monitoring well including explaining which methodology was used (i.e., WQO, MCL, current conditions) to derive the minimum threshold values. The GSAs should also provide more detail regarding how average concentrations (i.e., between 2015 and 2018), January 2015 baseline conditions, and “current conditions” were derived. The GSAs should compile this information – including the minimum thresholds; measurable objectives; and interim milestones – for each well in a tabular format indicating the minimum threshold value and any comparative averages and baseline conditions for the entire Basin.

RECOMMENDED CORRECTIVE ACTION 6

Reevaluate the sustainable management criteria for land subsidence and clarify in the GSP what specifically the GSA considers the quantitative definition of an undesirable results.

RECOMMENDED CORRECTIVE ACTION 7

Department staff understand that estimating the location, quantity, and timing of stream depletion due to ongoing, Basin-wide pumping is a complex task and that developing suitable tools may take additional time; however, it is critical for the Department’s ongoing

and future evaluations of whether GSP implementation is on track to achieve sustainable groundwater management. The Department plans to provide guidance on methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water and support for establishing specific sustainable management criteria in the near future. This guidance is intended to assist GSAs in understanding and sustainably managing depletions of interconnected surface water.

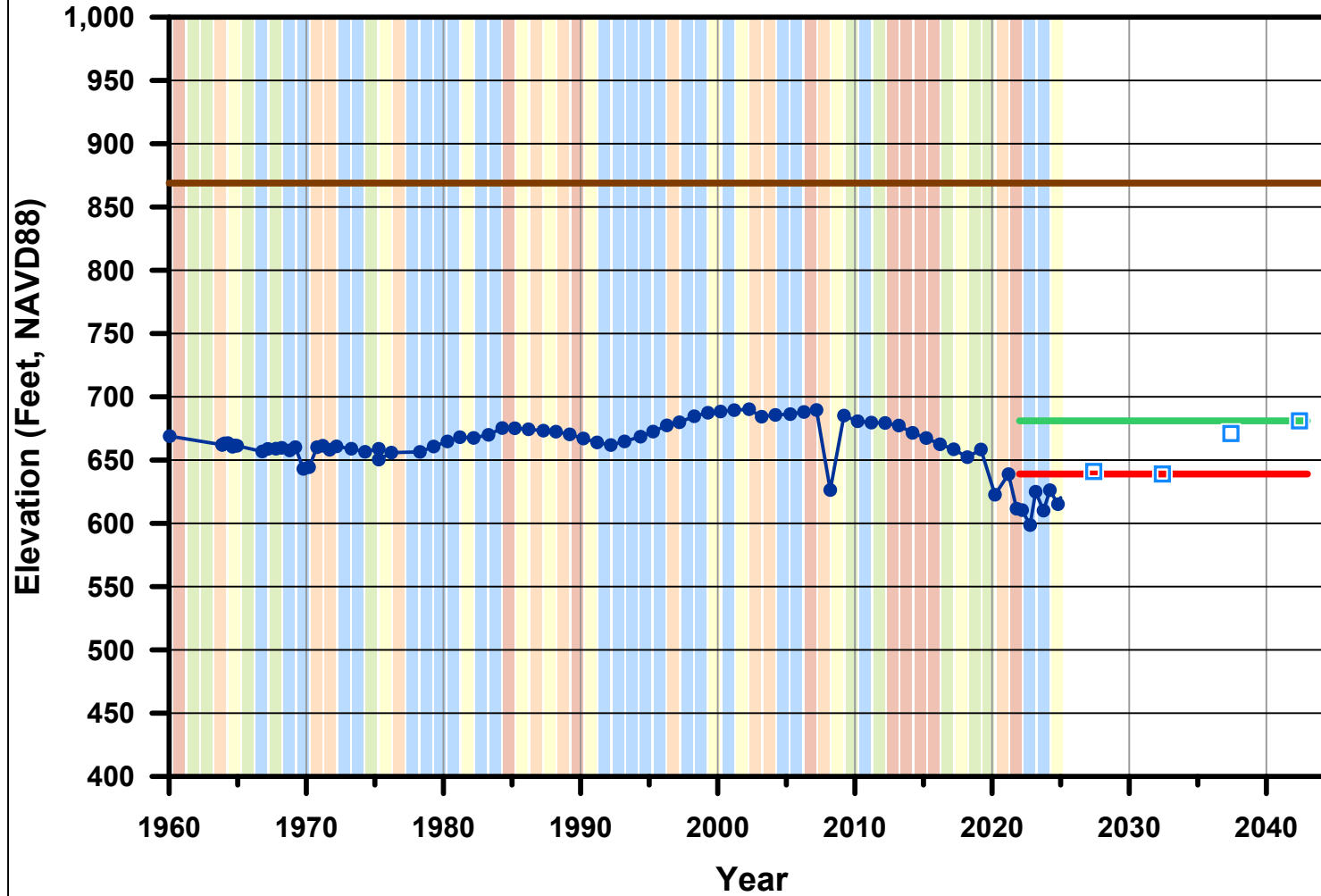
The GSA should work to address the following items by the first periodic evaluation:

- a. Provide additional details to demonstrate how the proposed minimum thresholds and measurable objectives for interconnected surface water will avoid an unreasonable depletion of surface water, supported by an analysis of the potential impacts to beneficial uses and users. Additionally, staff recommend that the GSAs eliminate the non-drought year condition in the definition of the undesirable result for depletions of interconnected surface water. The GSAs should also use fall or seasonal low groundwater levels to assess minimum thresholds and quantify undesirable results.
- b. Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to understand and manage depletions of interconnected surface water and define segments of interconnectivity and timing.
- c. Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion within the GSA's jurisdictional area.
- d. Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department to establish quantifiable minimum thresholds, measurable objectives, and management actions.

APPENDIX B

Hydrographs for Representative Wells

APPENDIX B 6N/29W-07L01 Paso Robles Formation

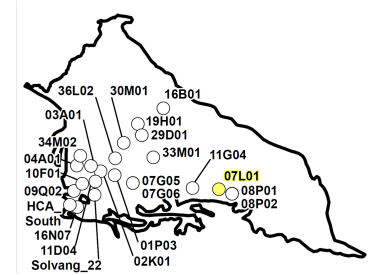


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

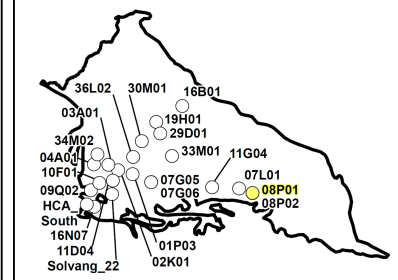
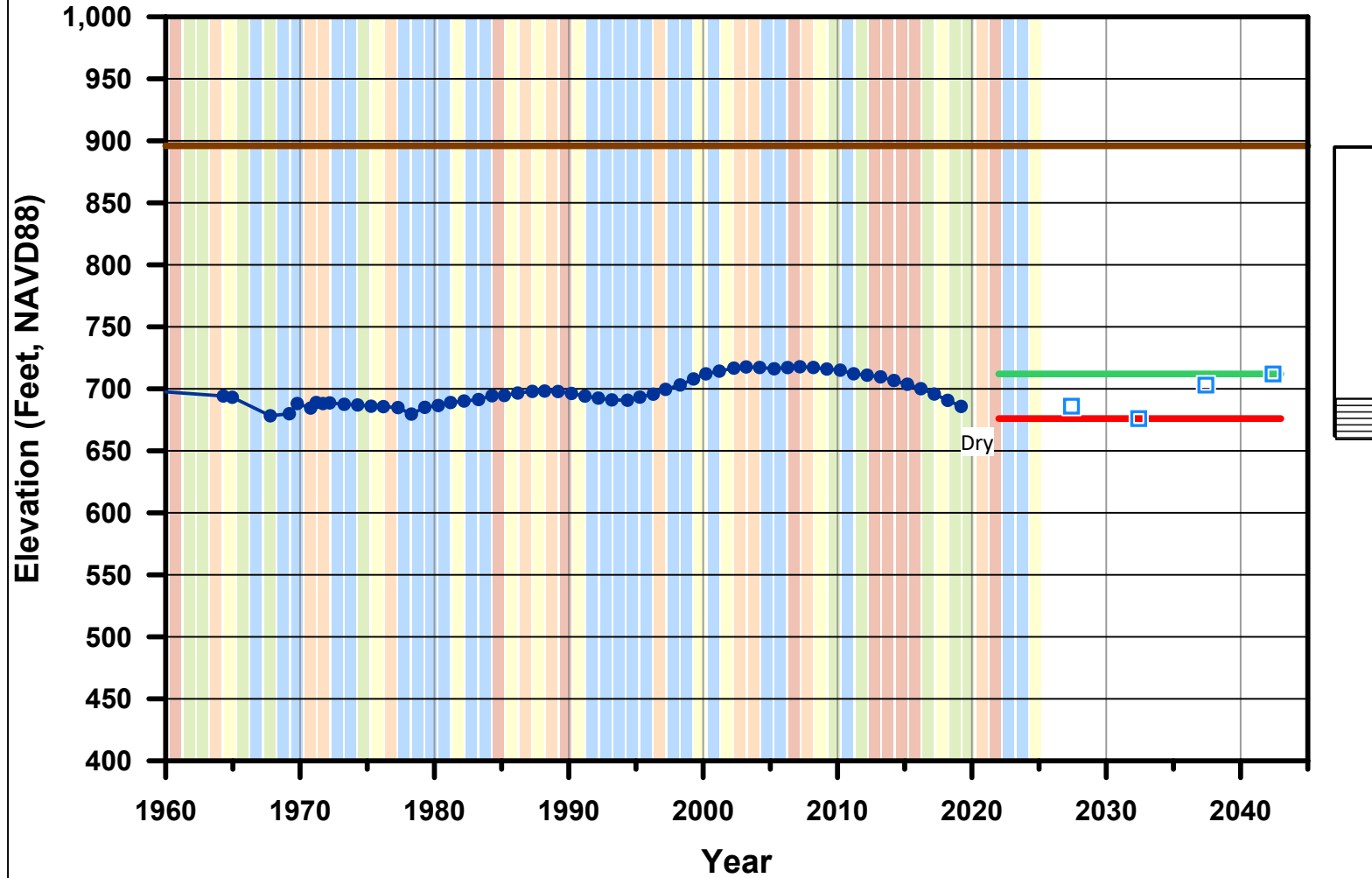
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Agricultural Well
Unknown Depth



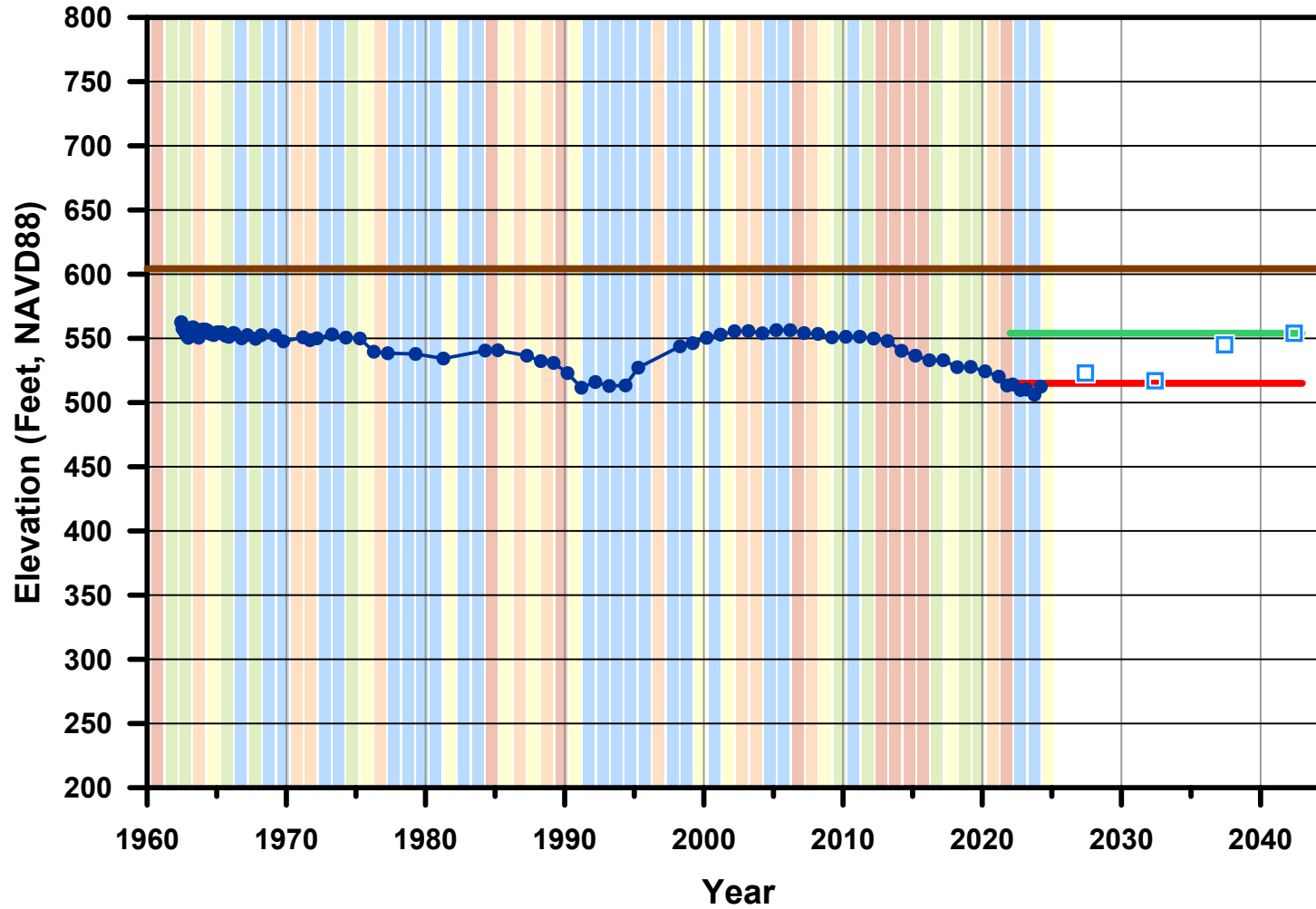
APPENDIX B **6N/29W-08P01** Paso Robles Formation



NOTE(S)
Domestic Well
Depth = 237 ft bgs



APPENDIX B **6N/30W-07G05** Paso Robles Formation

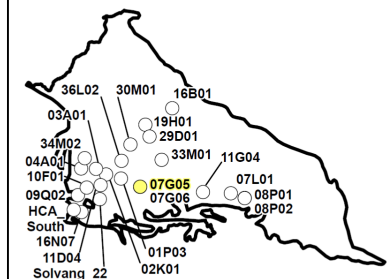


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

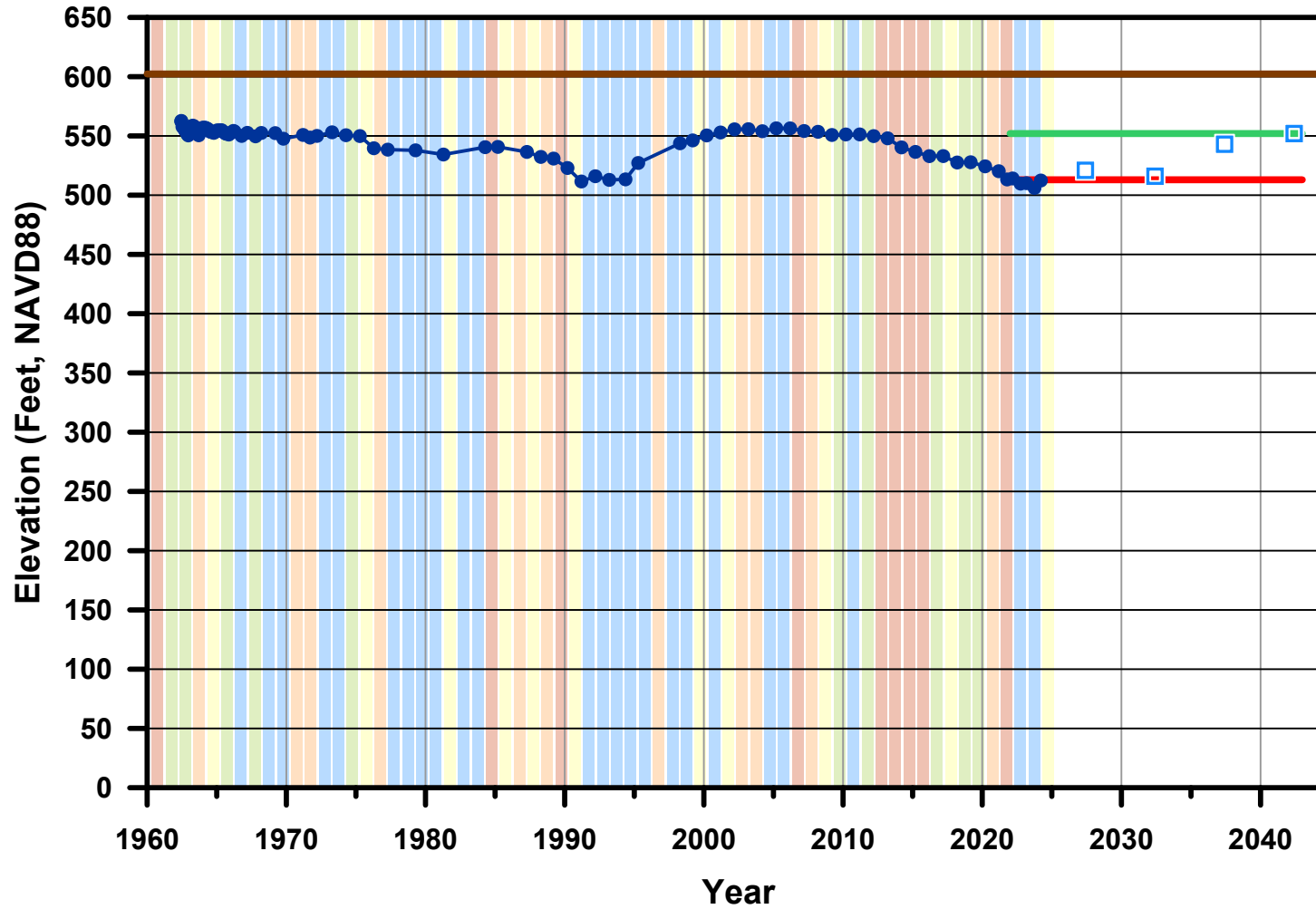
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Municipal Well
Depth = 166 ft bgs



APPENDIX B **6N/30W-07G06** Paso Robles Formation



LEGEND

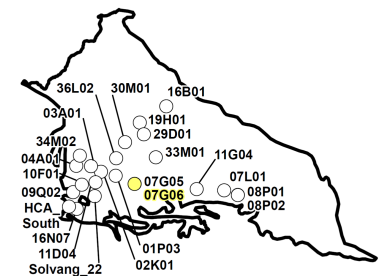
- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Well Specifications

- Screen Interval



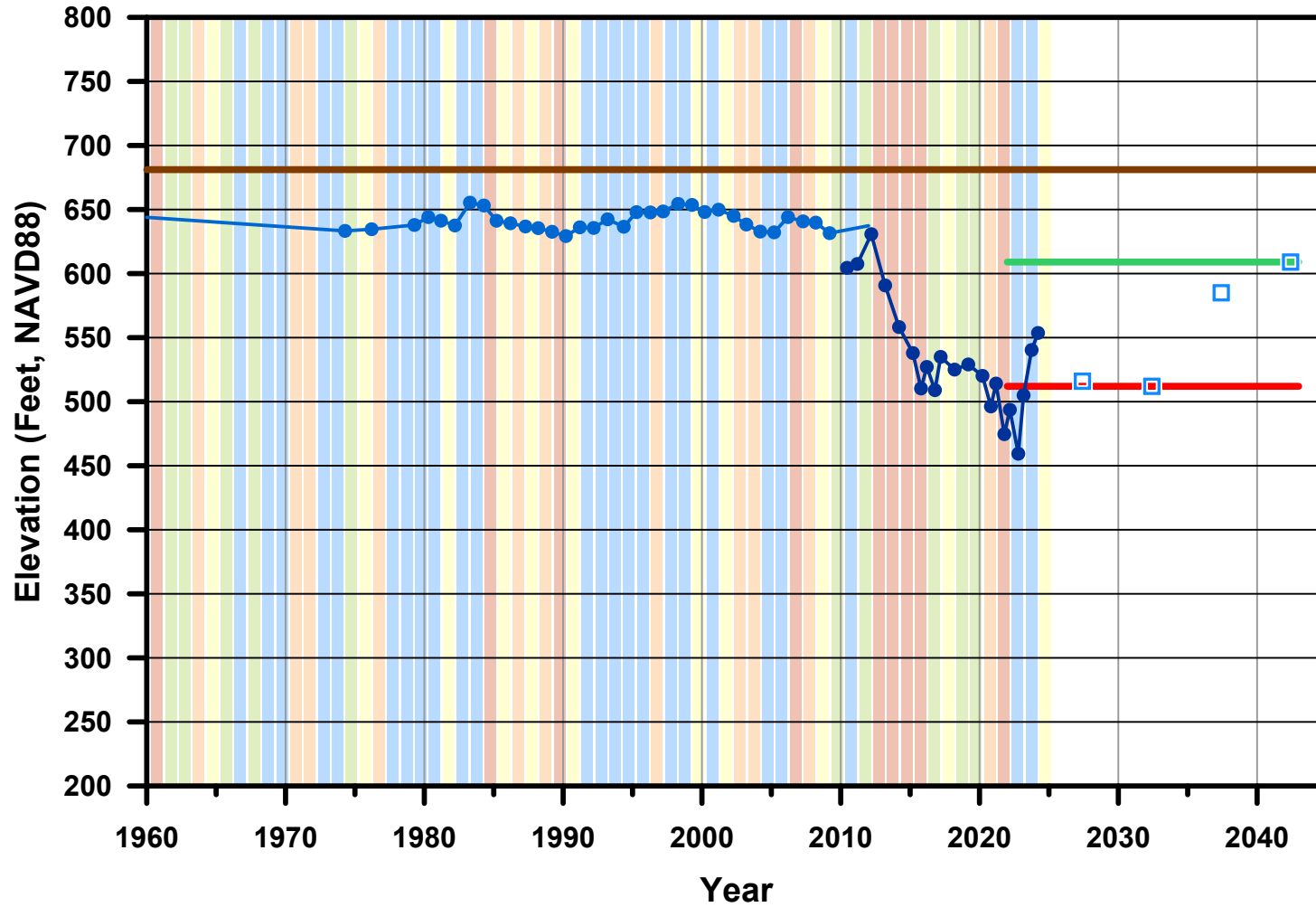
NOTE(S)
 Municipal Well
 Depth = 566 ft bgs



APPENDIX B

6N/30W-11G04

Paso Robles Formation



LEGEND

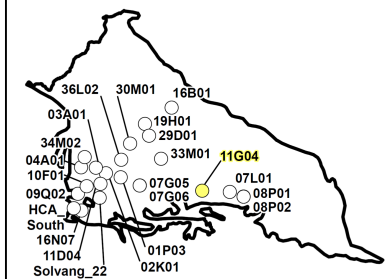
- Ground Surface Elevation
- Groundwater Elevation
- Groundwater Elevation - 11G01
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Well Details

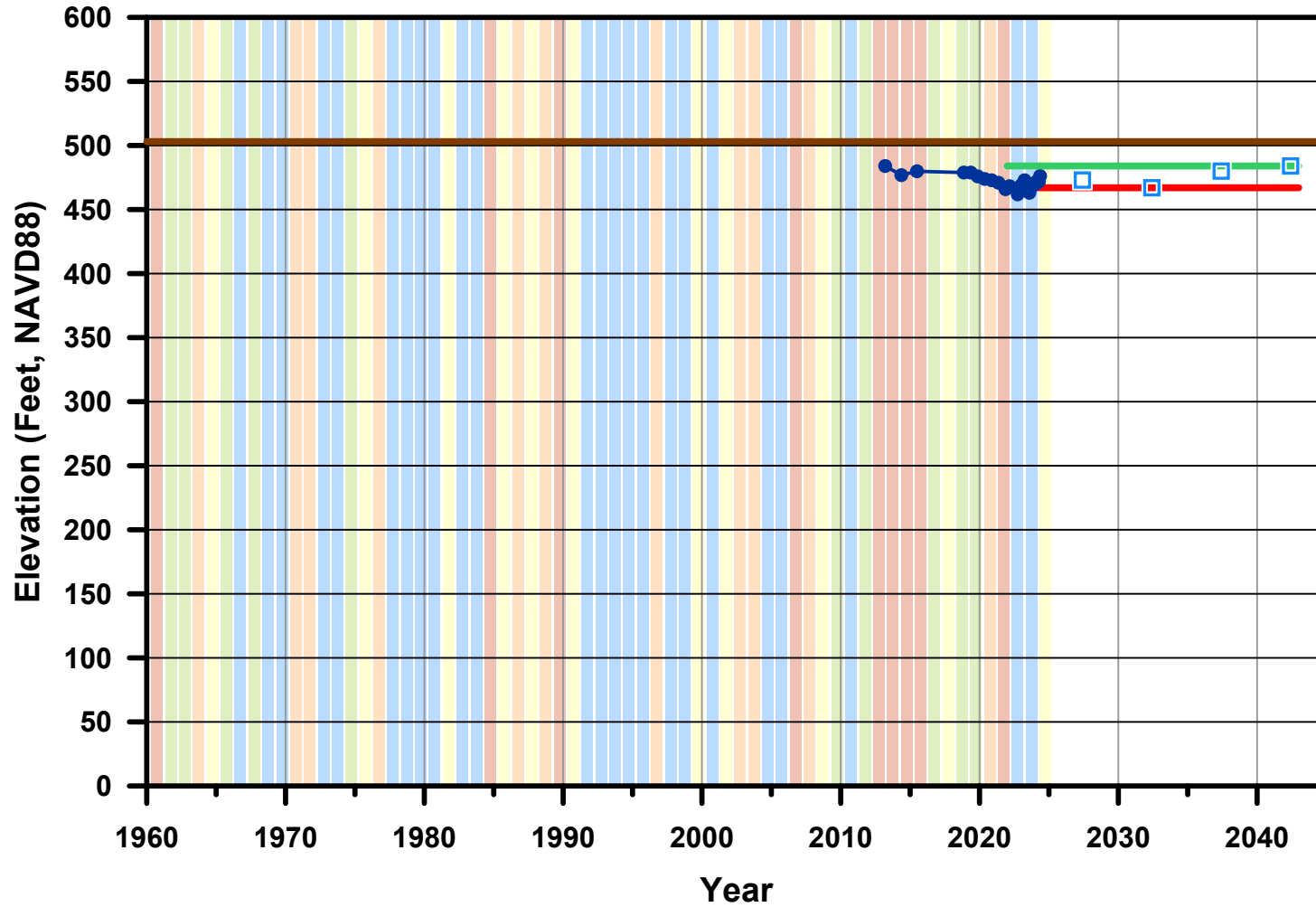
- Screen Interval



NOTE(S)
Agricultural Well
Depth 400 ft bgs



APPENDIX B **6N/31W-___ Solvang 22** **Careaga Sand**



LEGEND

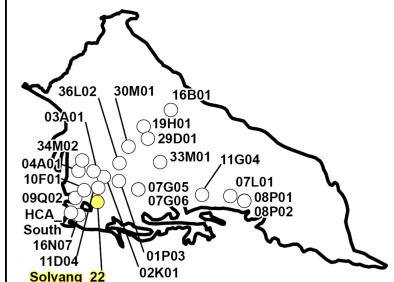
- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Well Details

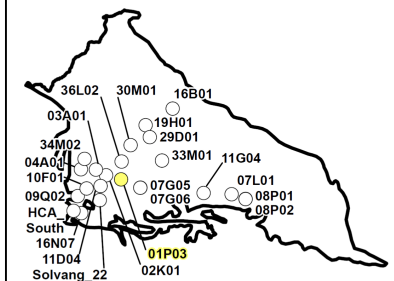
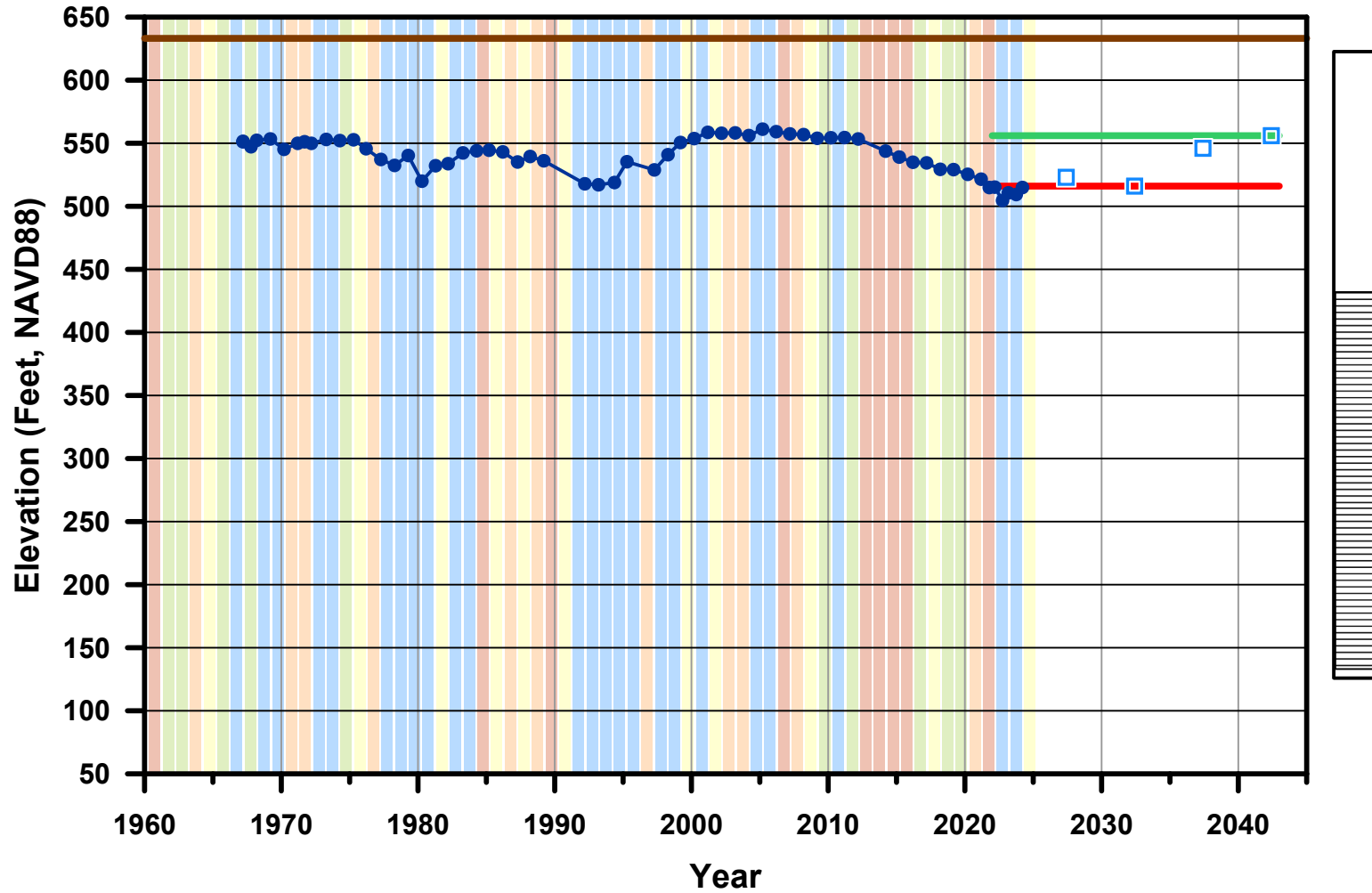
- Screen Interval



NOTE(S)
Municipal Well
Depth = 392 ft bgs



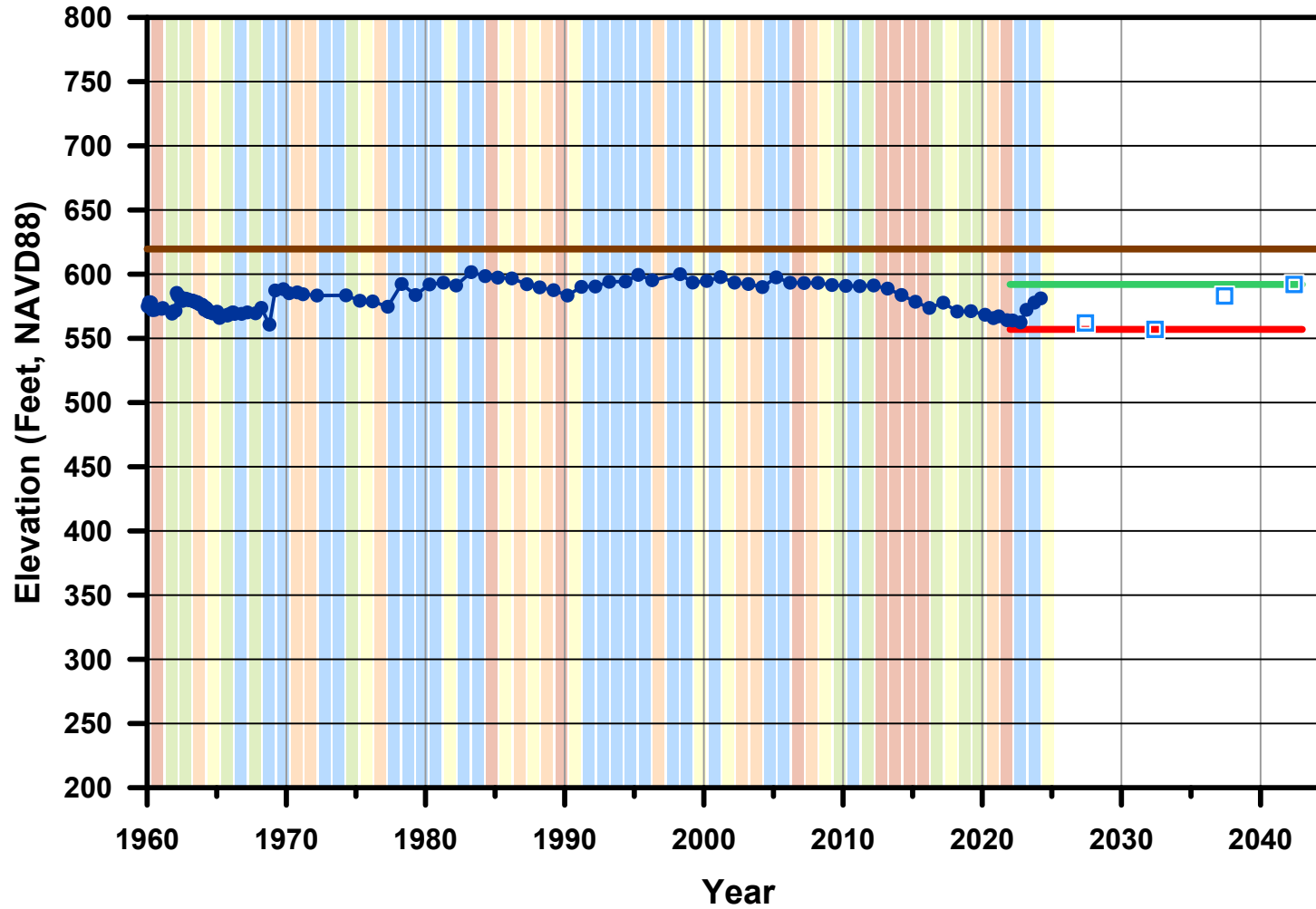
APPENDIX B **6N/31W-01P03** Paso Robles Formation



NOTE(S)
 Municipal Well
 Depth = 505 ft bgs



APPENDIX B 6N/31W-02K01 Paso Robles Formation

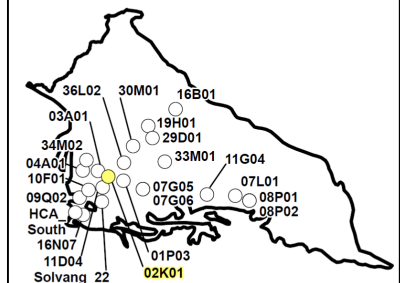


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

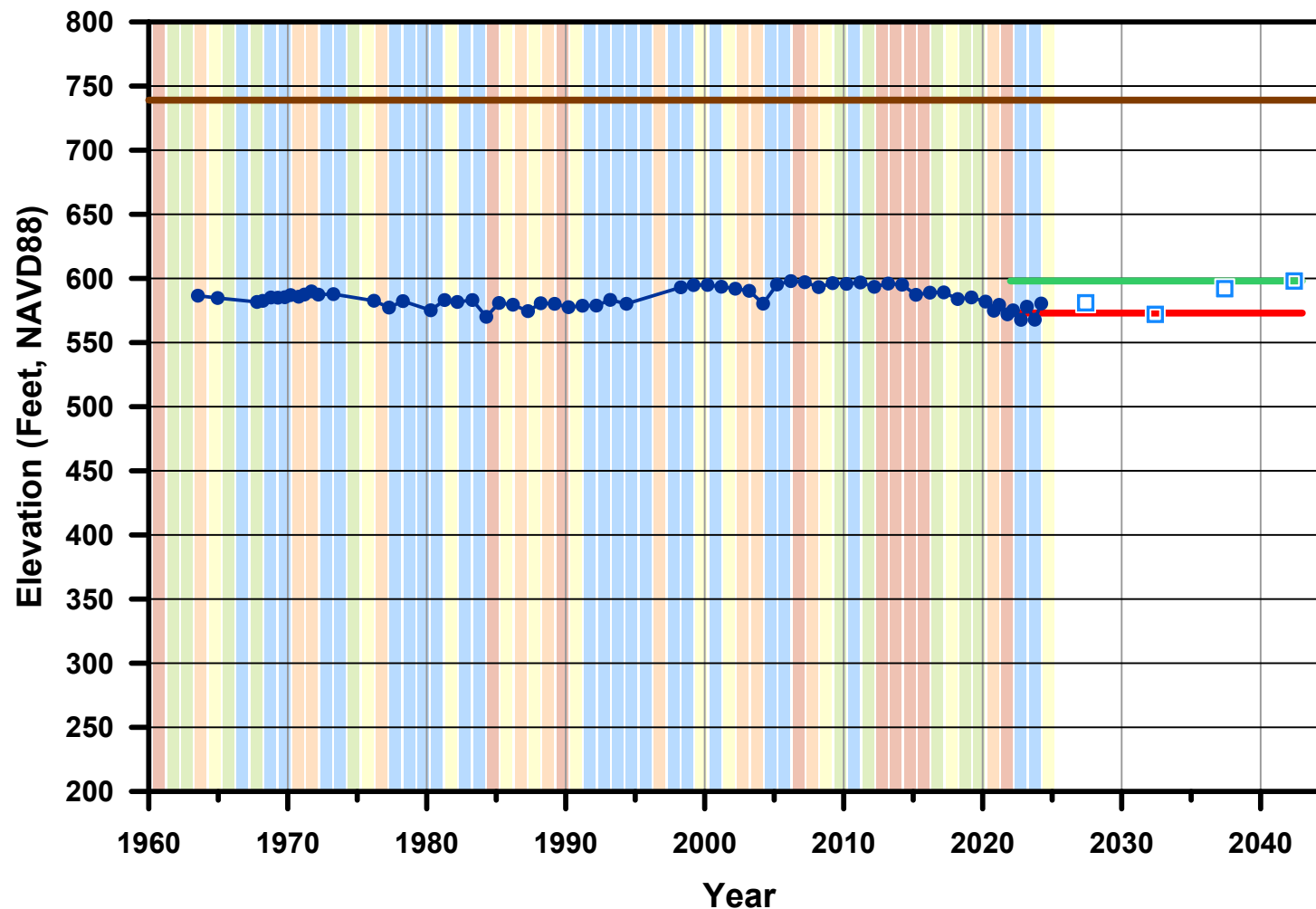
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Domestic Well
Unknown Depth



APPENDIX B 6N/31W-03A01 Careaga Sand

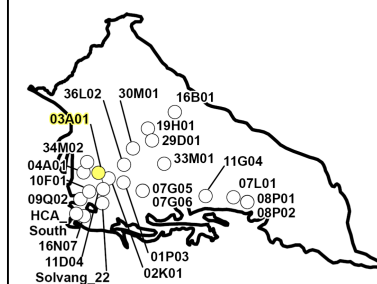


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

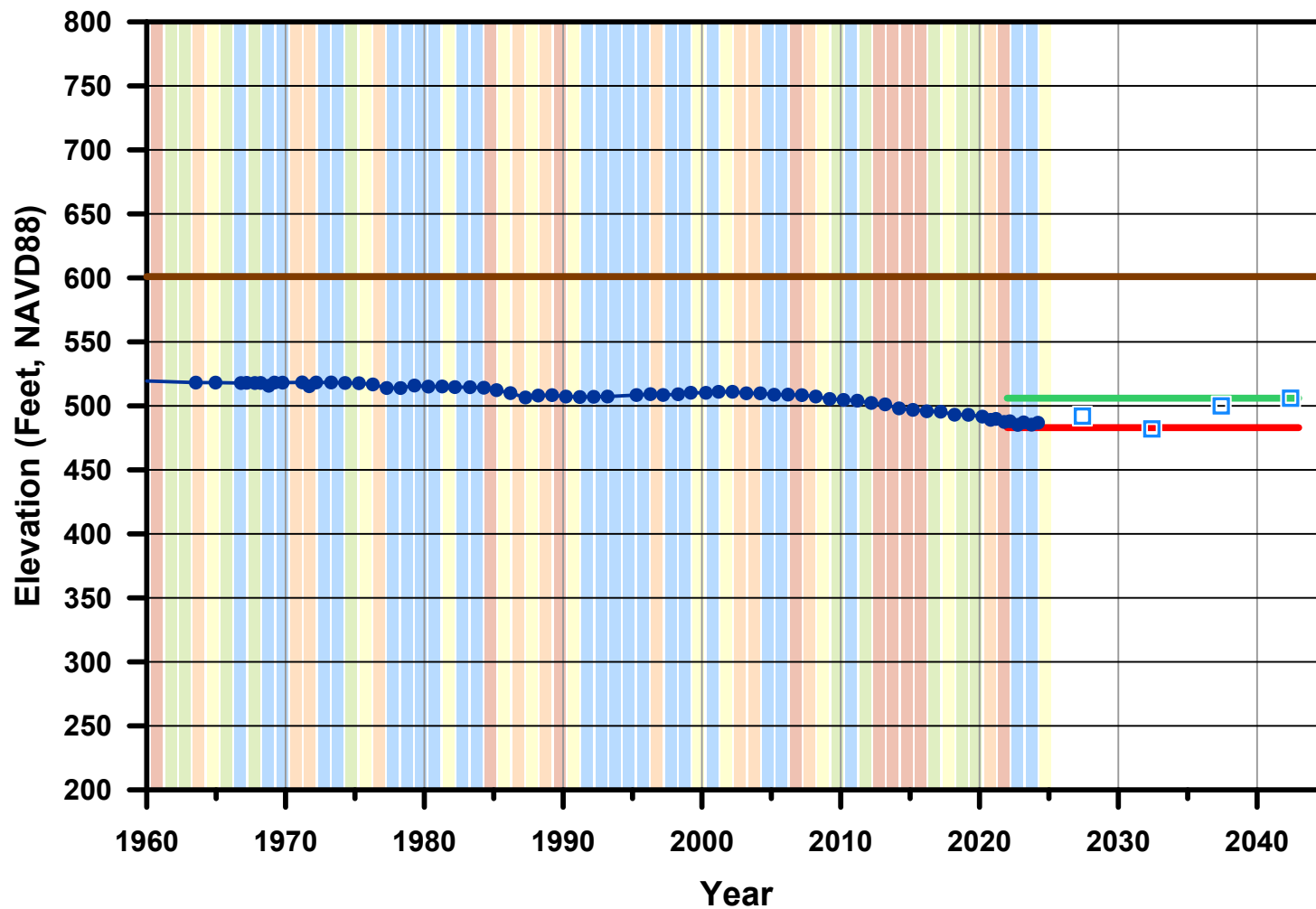
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Domestic Well
Unknown Depth



APPENDIX B **6N/31W-04A01** Careaga Sand



LEGEND

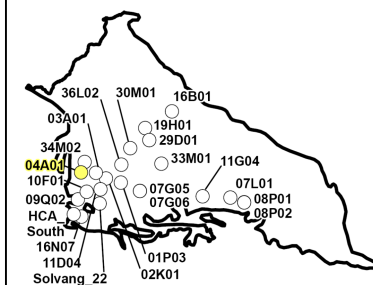
- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Well Details

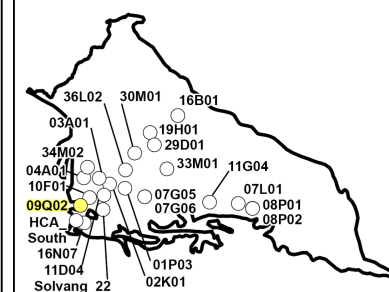
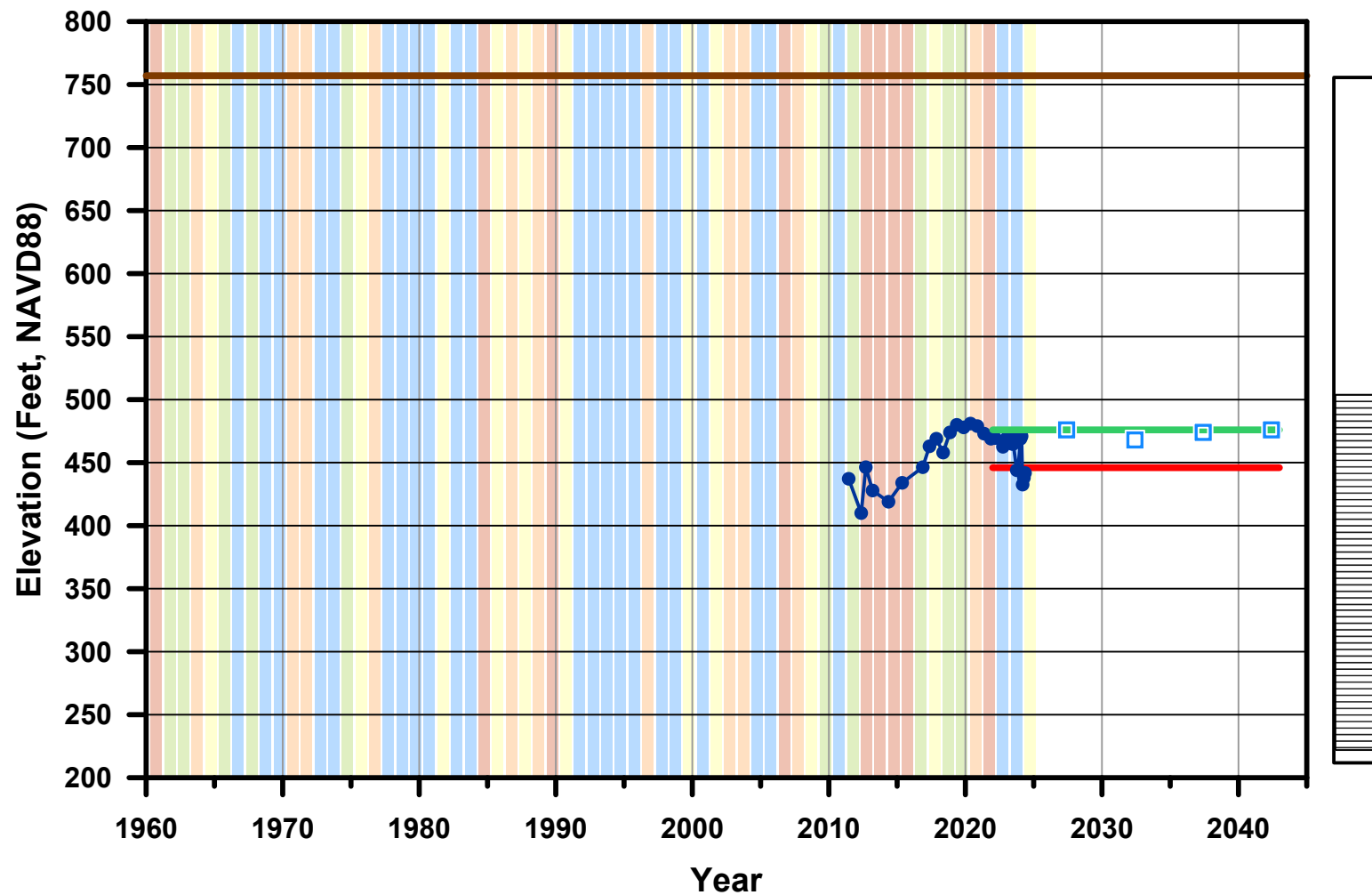
- Screen Interval



NOTE(S)
 Domestic Well
 Depth = 259ft bgs



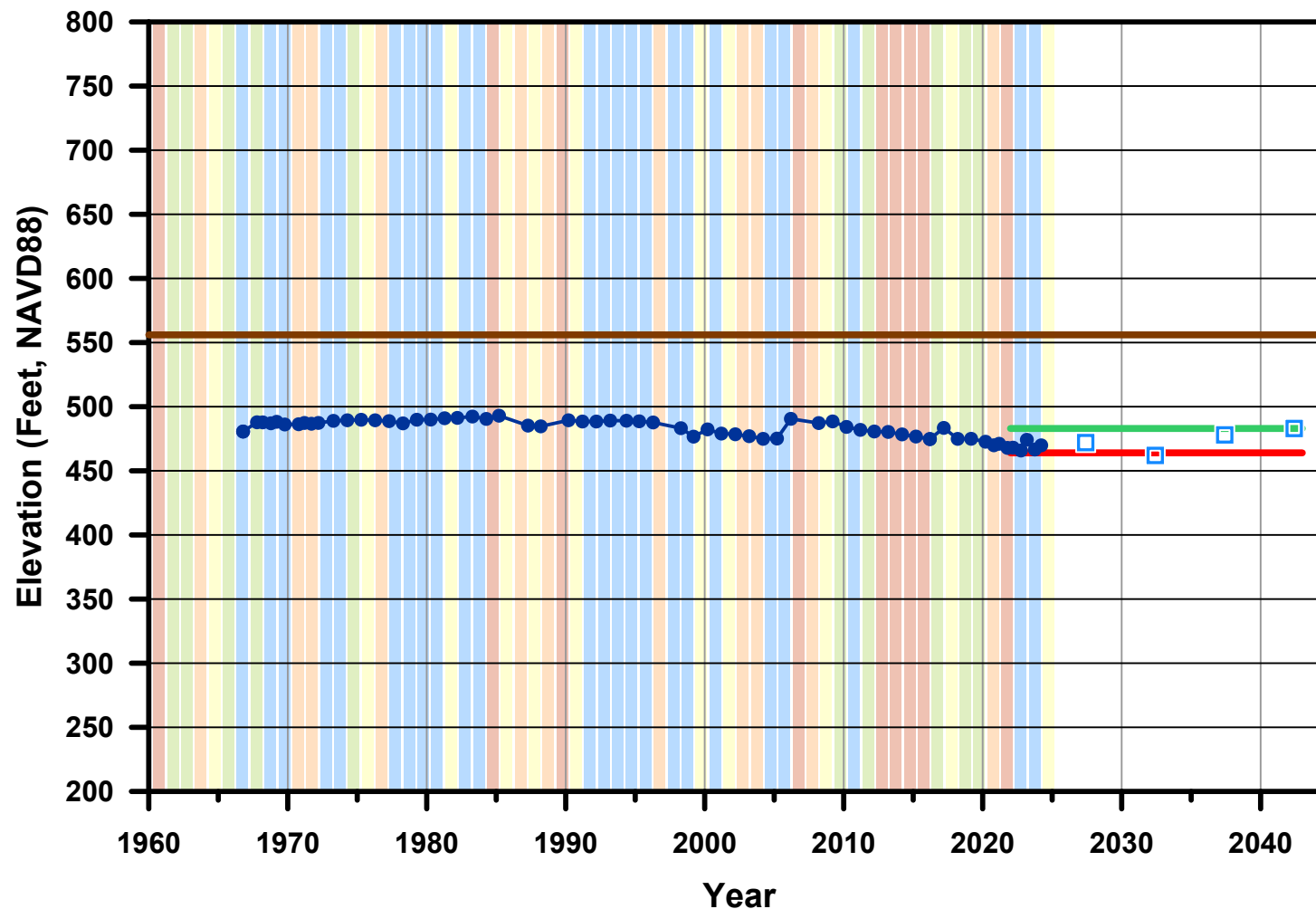
APPENDIX B 6N/31W-09Q02 Careaga Sand



NOTE(S)
Municipal Well
Depth = 550 ft bgs



APPENDIX B 6N/31W-10F01 Careaga Sand

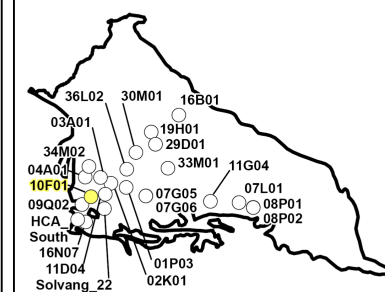


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

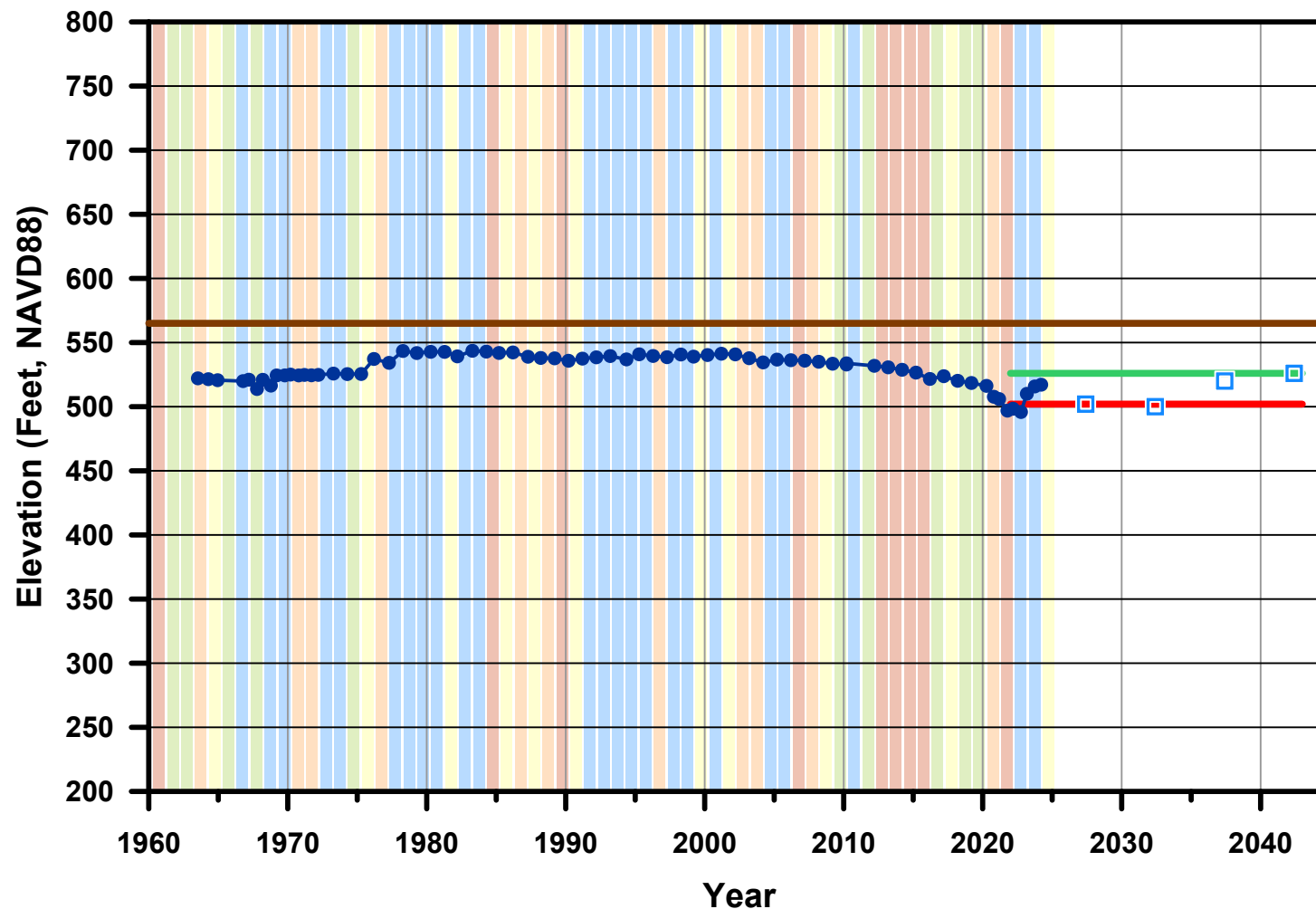
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Agricultural Well
Depth = 265 ft bgs



APPENDIX B 6N/31W-11D04 Careaga Sand

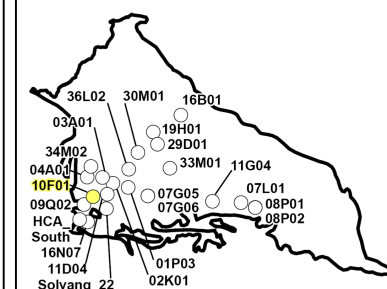


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

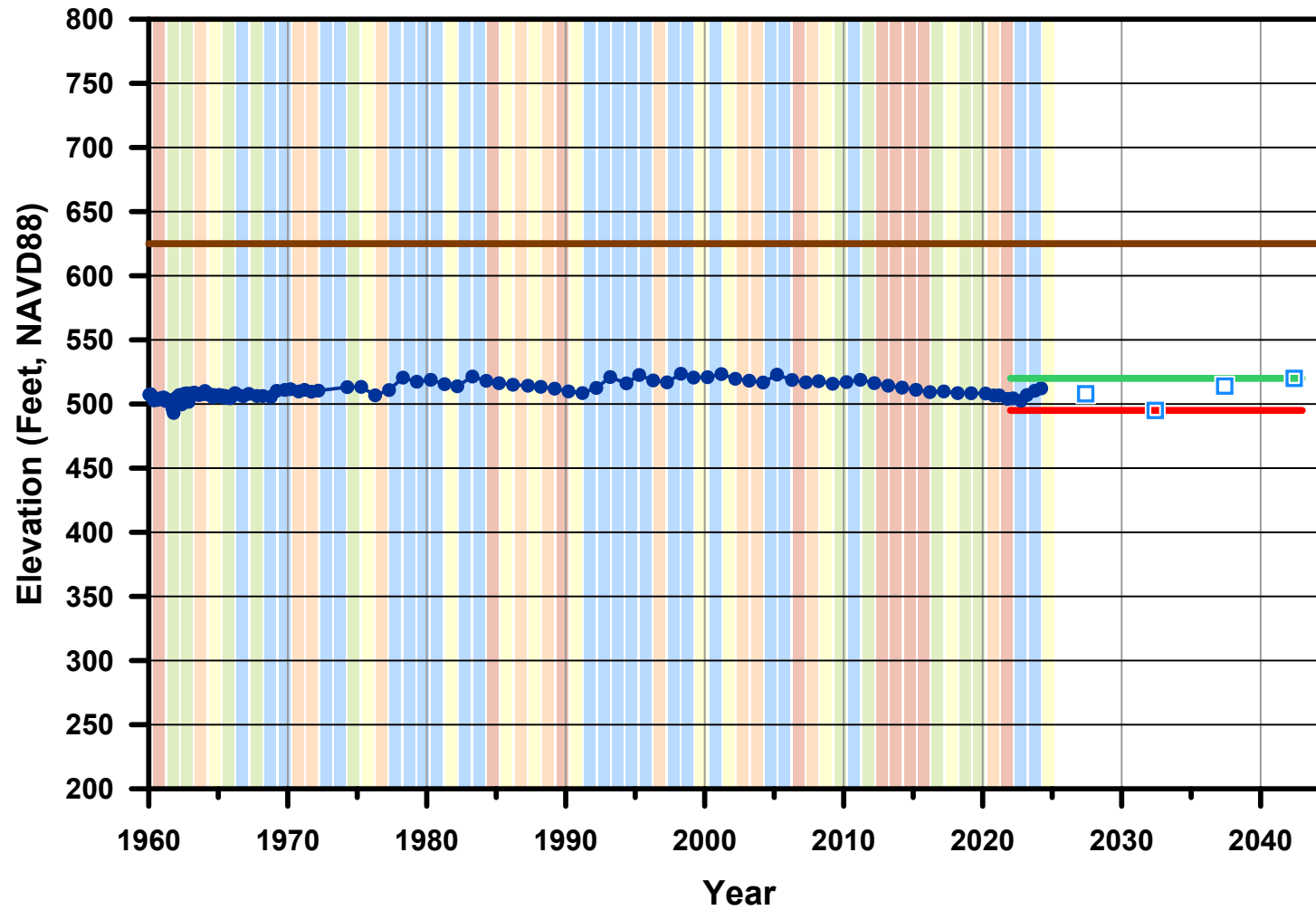
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Agricultural Well
Depth = 447 ft bgs



APPENDIX B 6N/31W-13D01 Paso Robles Formation



LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

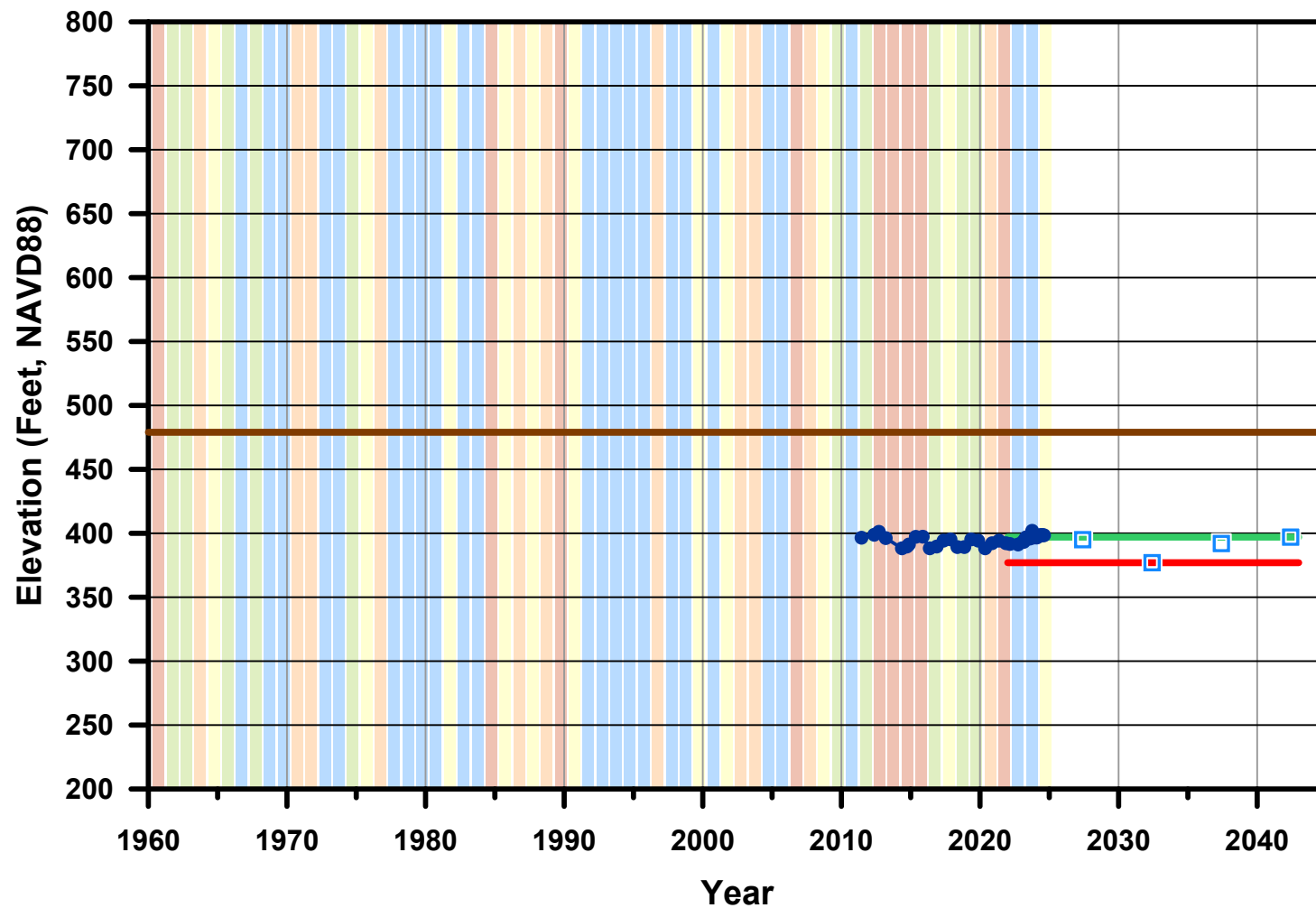
Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

NOTE(S)
Domestic Well
Depth = 152 ft bgs



APPENDIX B 6N/31W-16N07 Careaga Sand



LEGEND

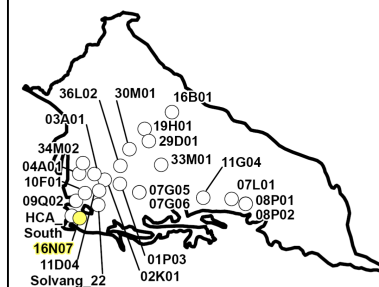
- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Well Details

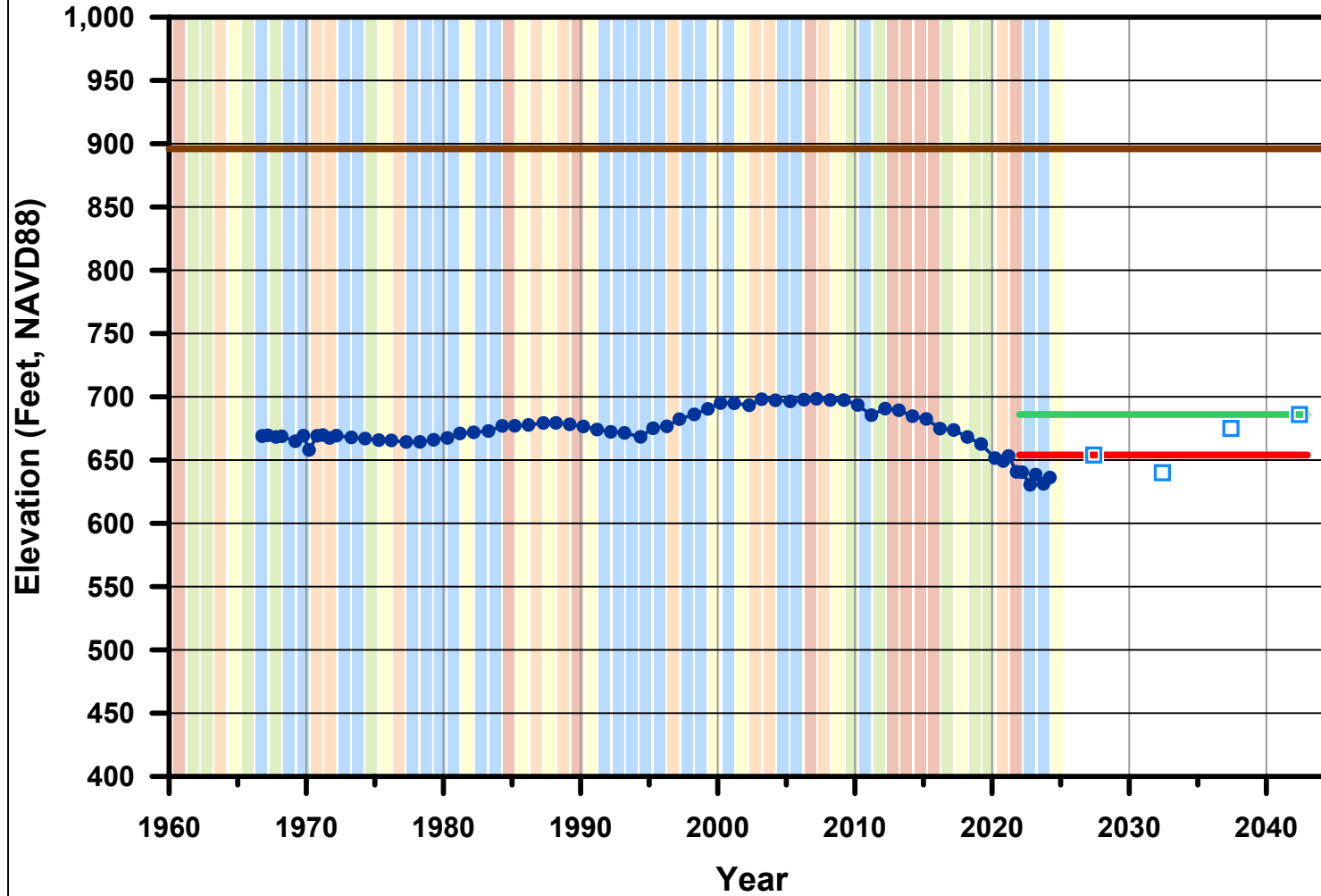
- Screen Interval



NOTE(S)
Municipal Well
Depth = 145 ft bgs



APPENDIX B **6N/29W-08P02** Paso Robles Formation

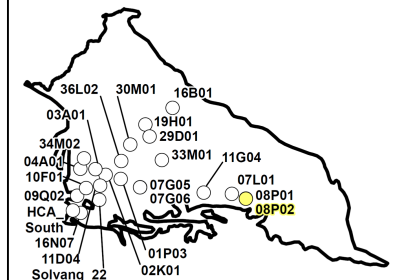


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical



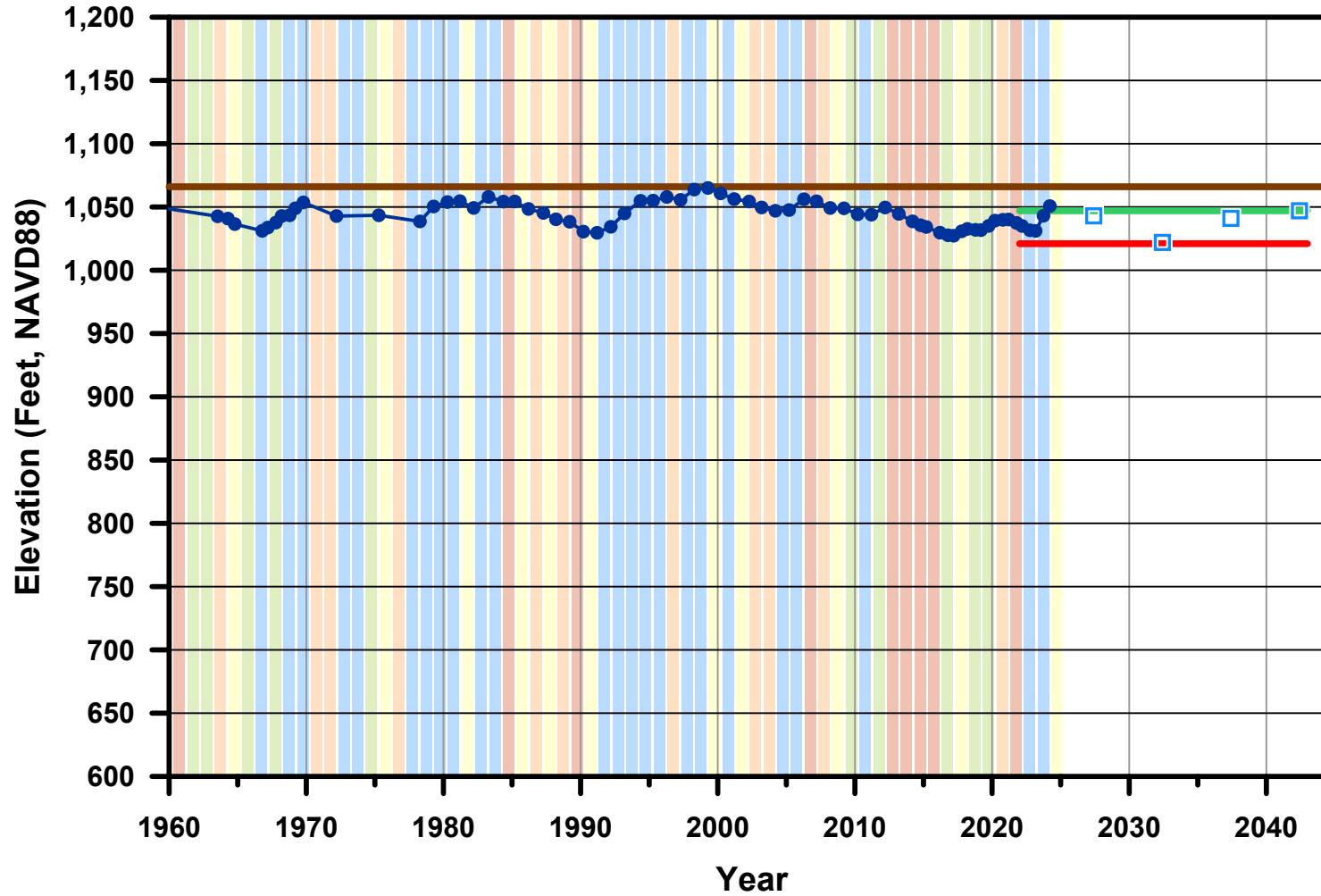
NOTE(S)
Domestic Well
Unknown Depth



APPENDIX B

7N/30W-16B01

Paso Robles Formation

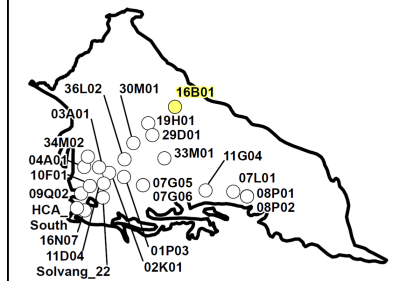


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

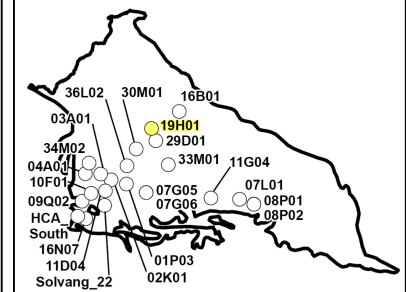
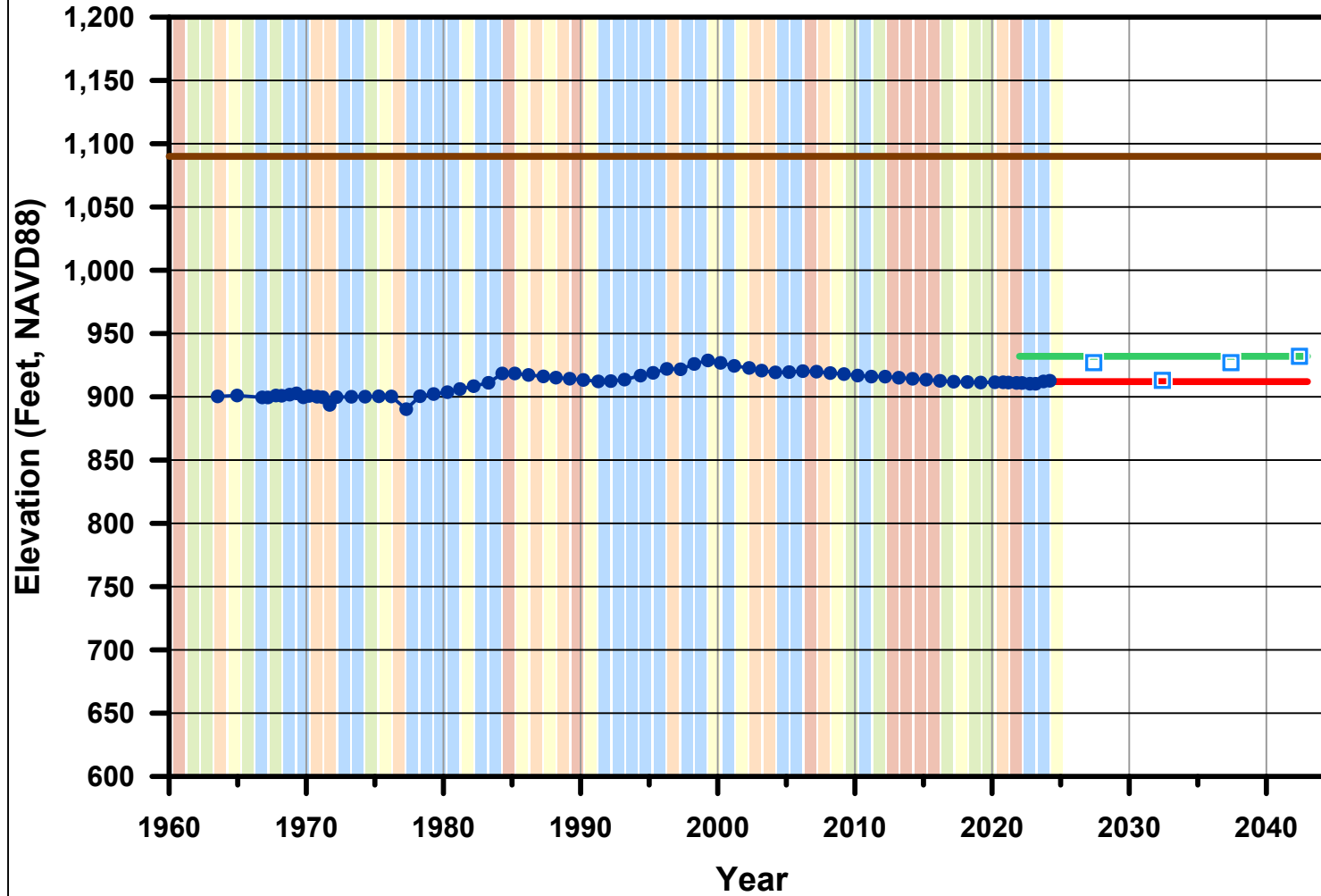
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Agricultural Well
Unknown Depth



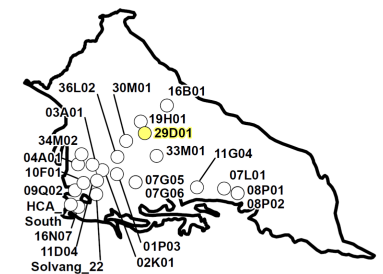
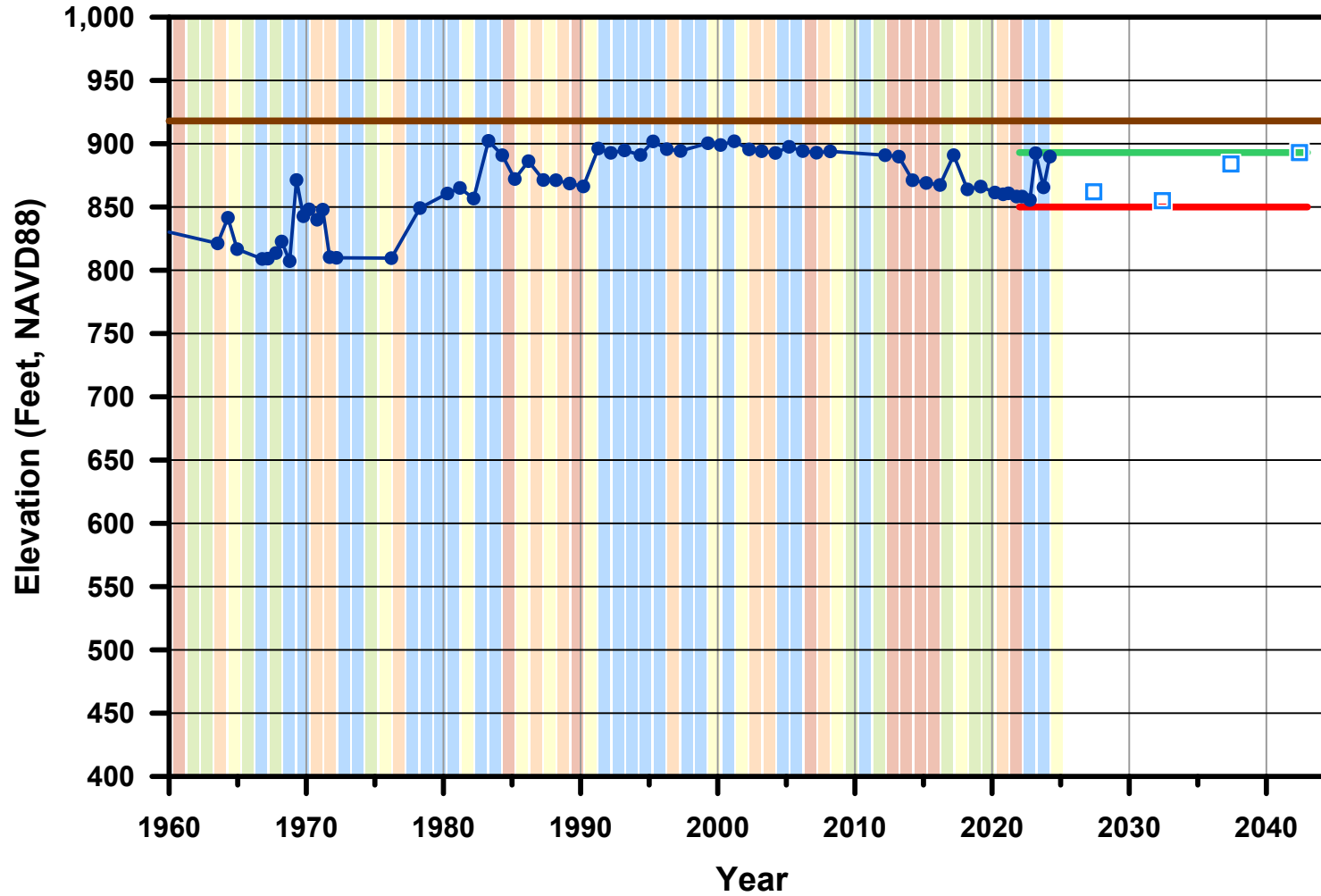
APPENDIX B 7N/30W-19H01 Paso Robles Formation



NOTE(S)
Agricultural Well
Unknown Depth



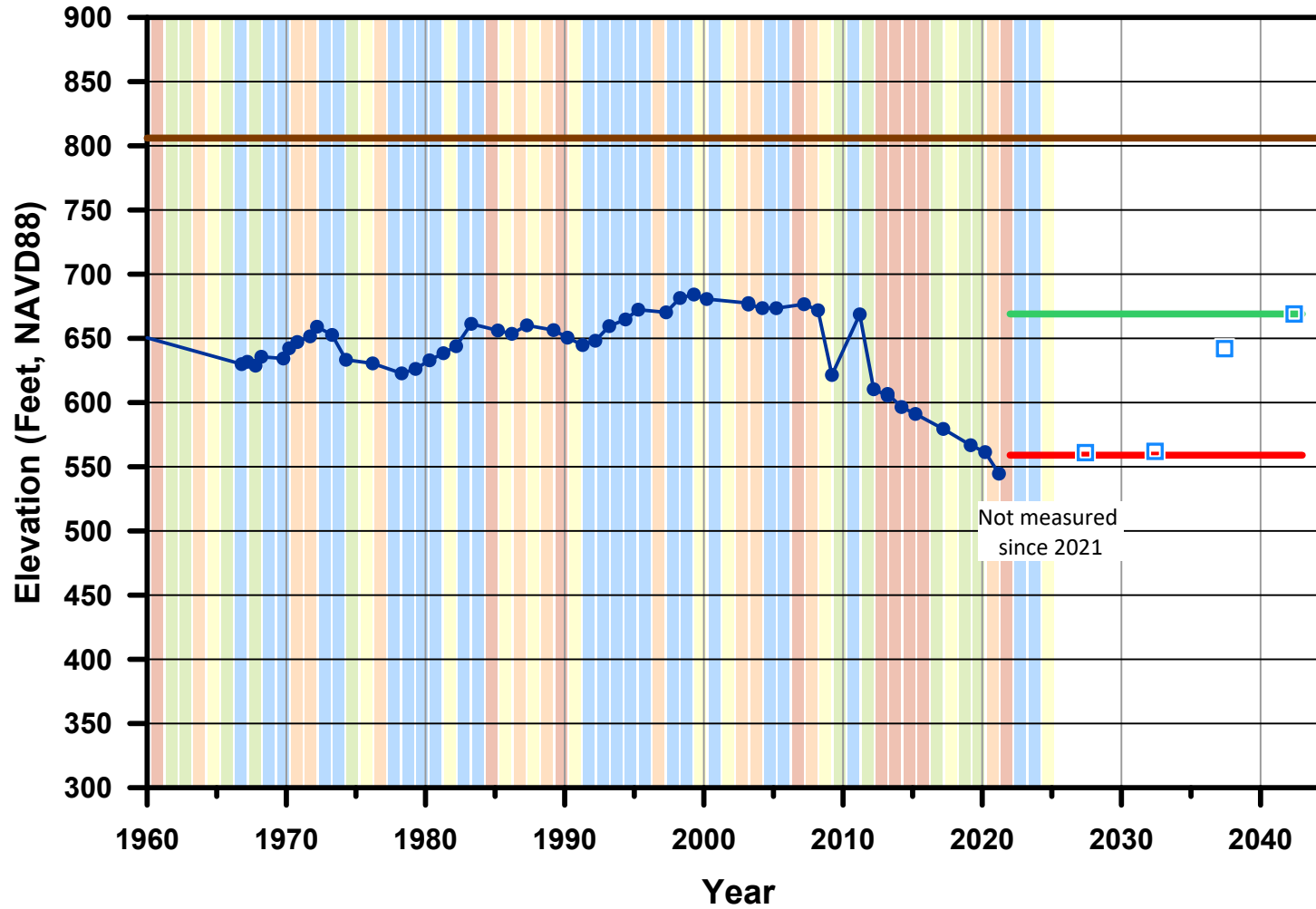
APPENDIX B **7N/30W-29D01** Paso Robles Formation



NOTE(S)
 Agricultural Well
 Unknown Depth



APPENDIX B **7N/30W-30M01** Paso Robles Formation

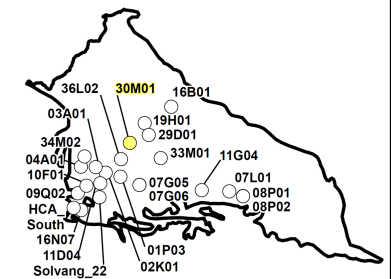


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

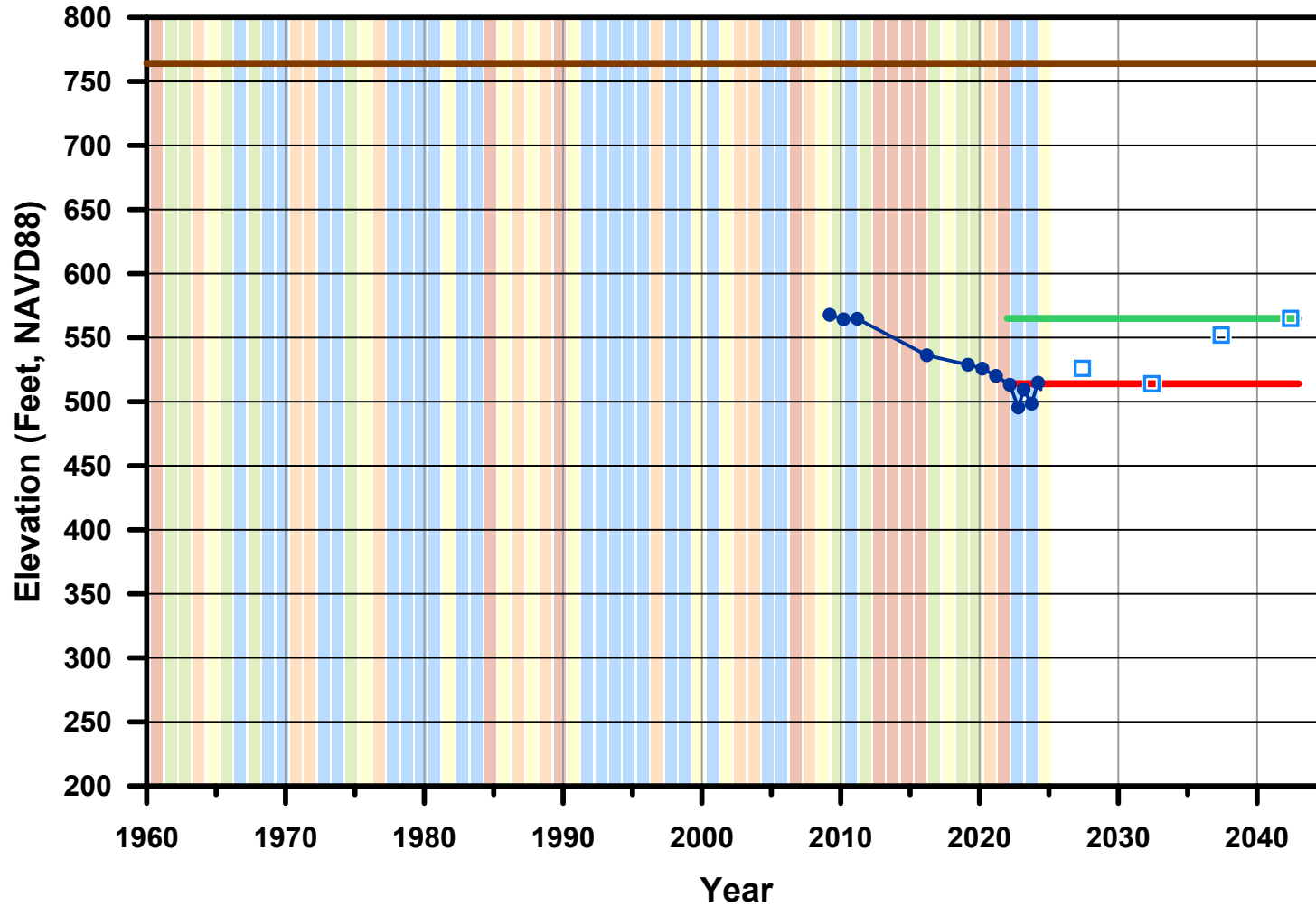
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
 Agricultural Well
 Unknown Depth



APPENDIX B **7N/30W-33M01** Paso Robles Formation



LEGEND

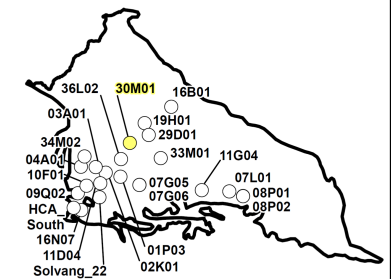
- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

- Wet
- Above Normal
- Below Normal
- Dry
- Critical

Well Details

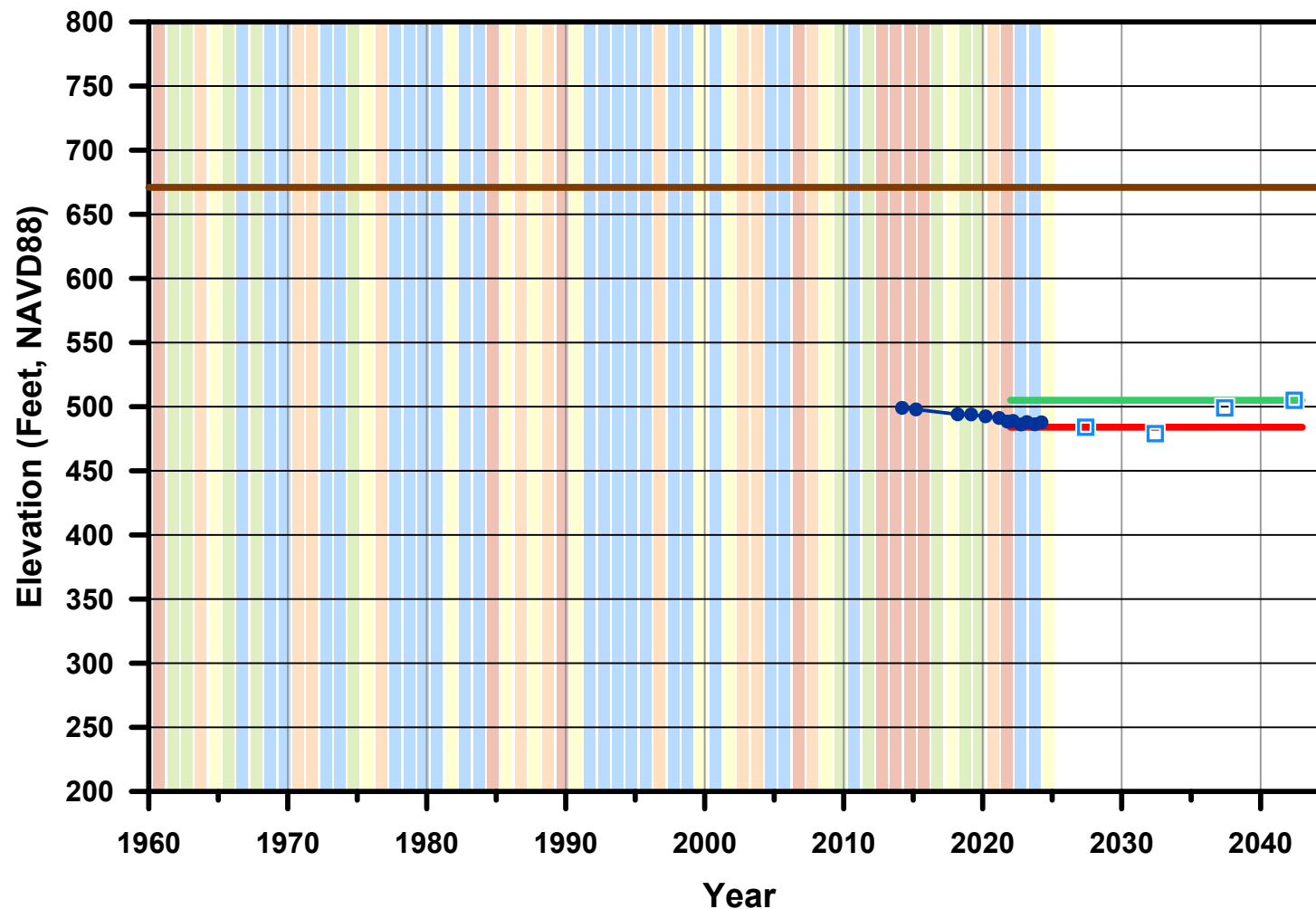
- Screen Interval



NOTE(S)
 Agricultural Well
 Depth = 349 ft bgs



APPENDIX B 7N/31W-34M02 Careaga Sand

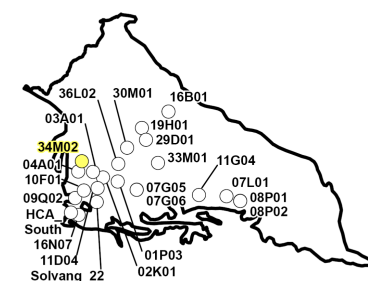


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

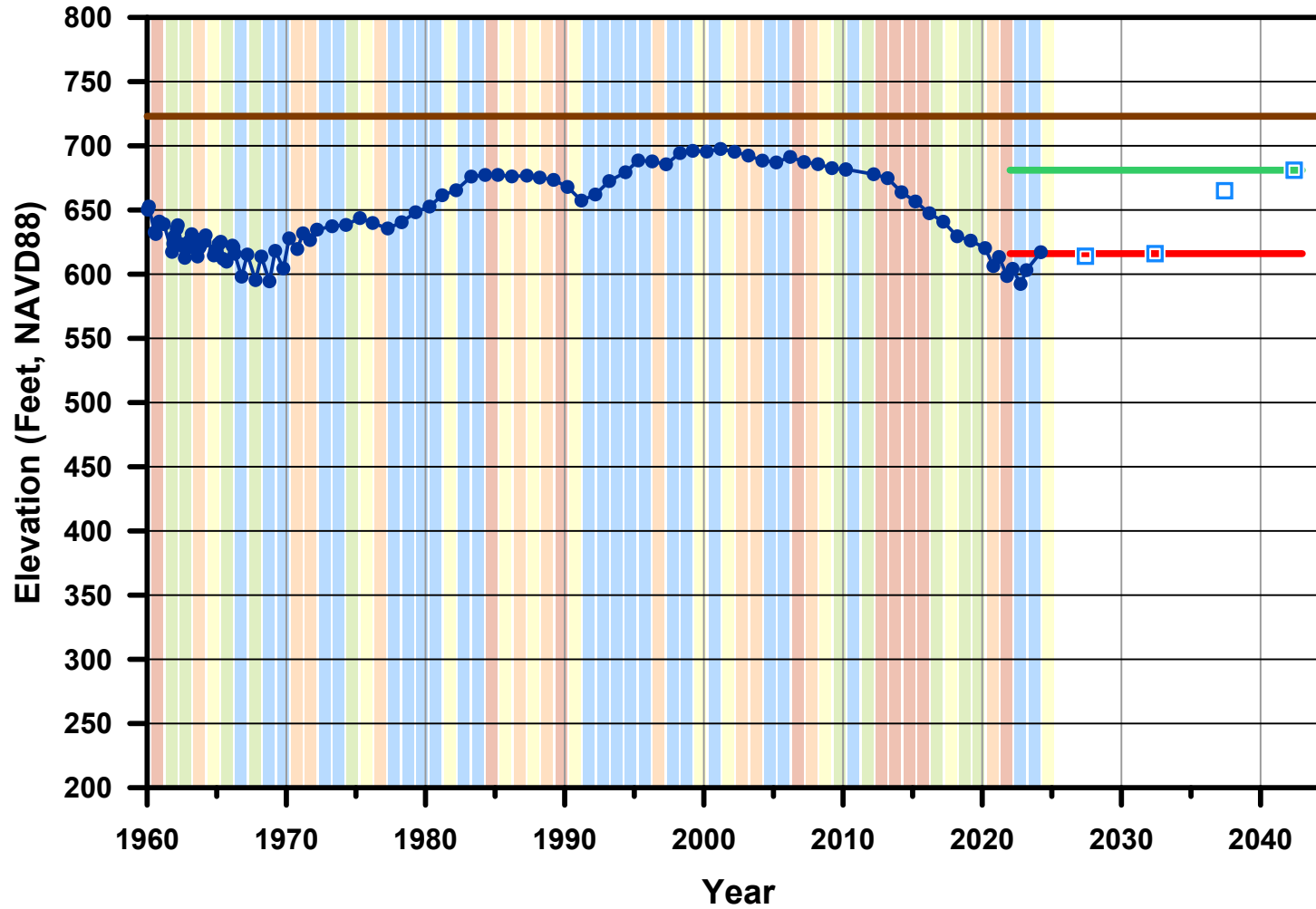
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
Agricultural Well
Unknown Depth



APPENDIX B **7N/31W-36L02** Paso Robles Formation

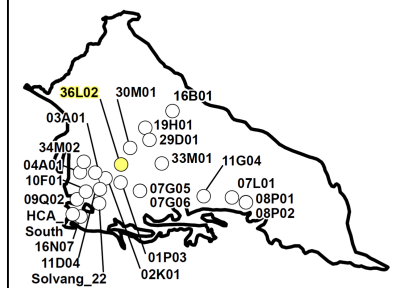


LEGEND

- Ground Surface Elevation
- Groundwater Elevation
- Measurable Objective
- Minimum Threshold
- Interim Milestone

Water Year Type

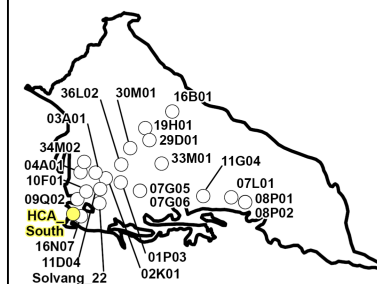
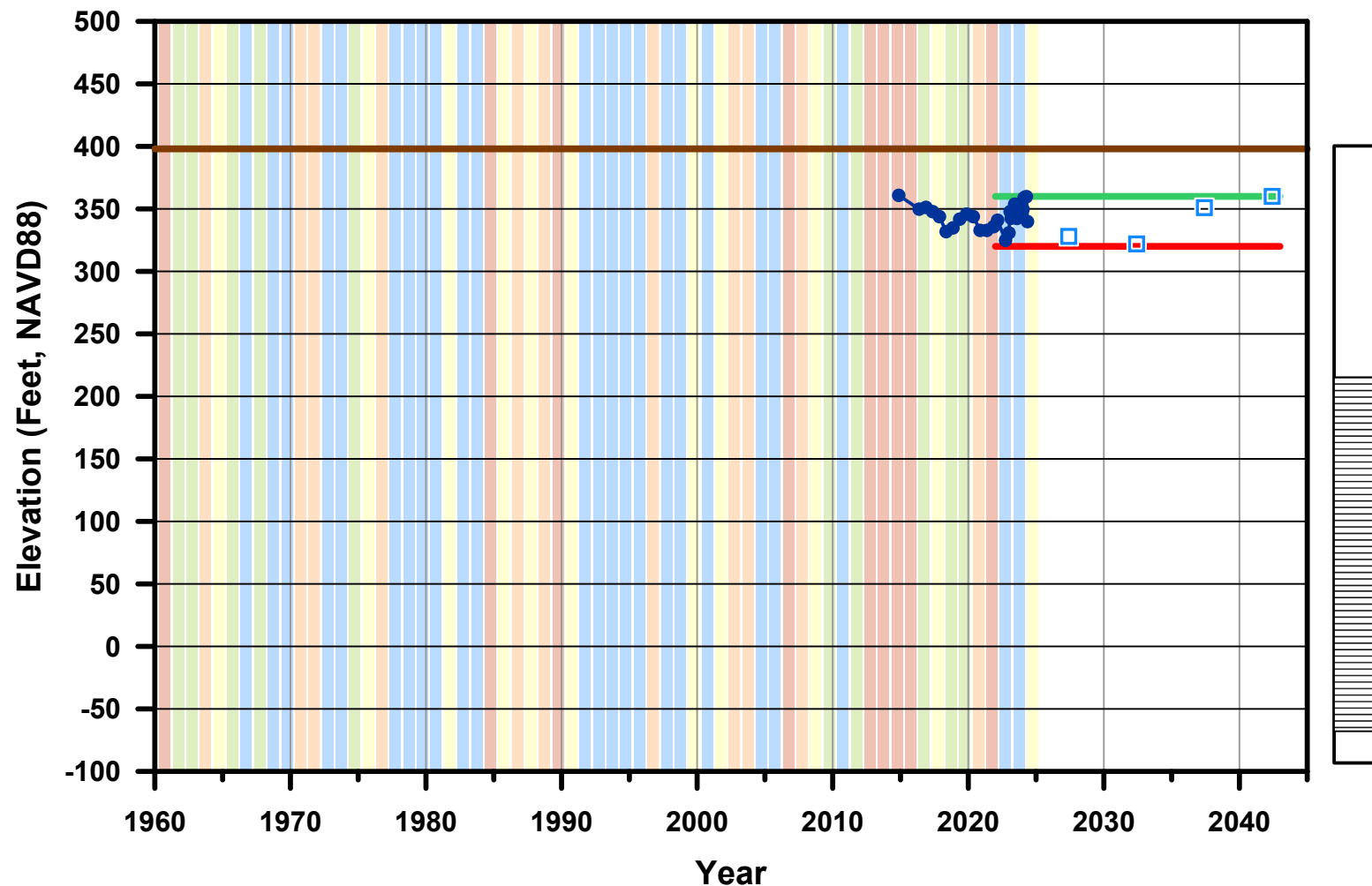
- Wet
- Above Normal
- Below Normal
- Dry
- Critical



NOTE(S)
 Domestic Well
 Unknown Depth



APPENDIX B HCA Solvang Careaga Sand

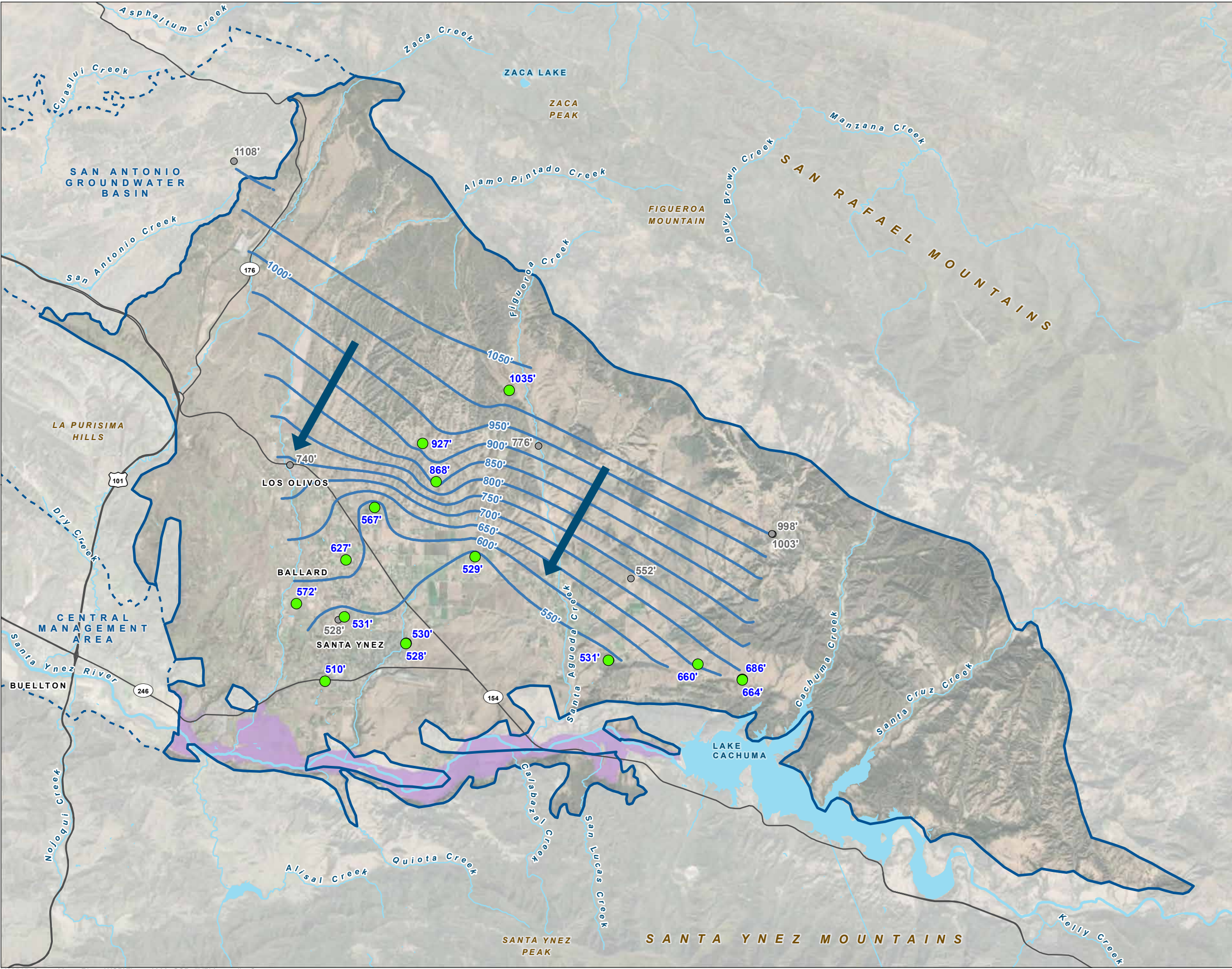


NOTE(S)
Municipal Well
Depth = 490 ft bgs



APPENDIX C

Bi-Annual Groundwater Elevation Maps
for Water Years 2019 through 2024



APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Spring 2019
Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater Elevation, Spring 2019

Groundwater Flow Direction

Santa Ynez River Area

Paso Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

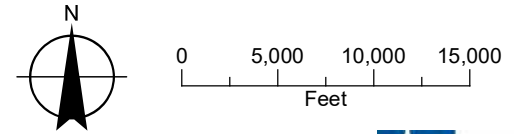
Eastern Management Area Bulletin 118 Boundary

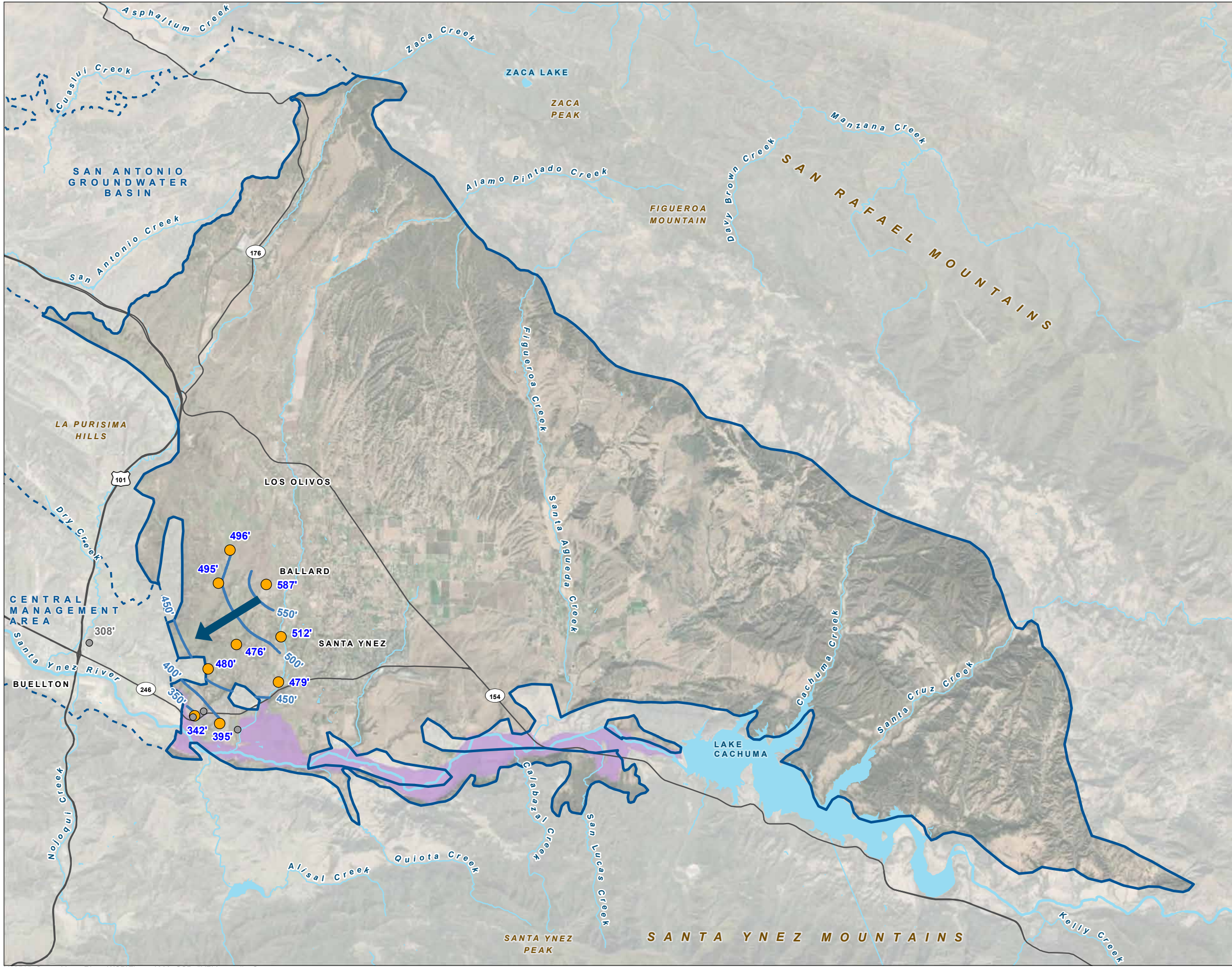
Other Bulletin 118 Groundwater Basin Boundary

Major Road

Watercourse

Waterbody





APPENDIX C

Careaga Sand Groundwater Elevation Contours, Spring 2019

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater
Elevation, Spring 2019

Groundwater Flow Direction

Santa Ynez River Area

Careaga Sand Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

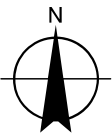
Eastern Management Area Bulletin 118
Boundary

Other Bulletin 118 Groundwater Basin
Boundary

Major Road

Watercourse

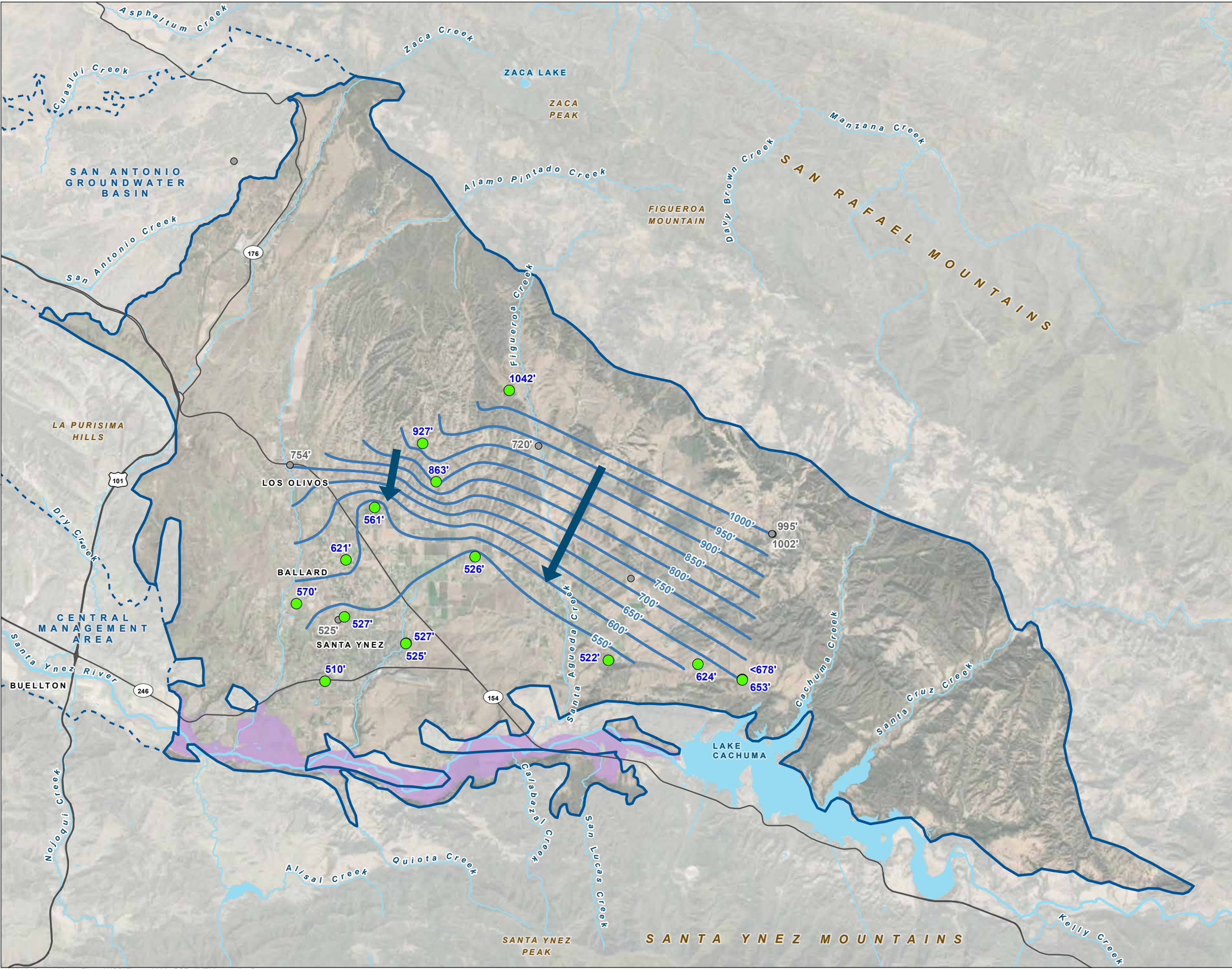
Waterbody



0 5,000 10,000 15,000
Feet



Date: March 21, 2022
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Spring 2020

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater Elevation, Spring 2020

Groundwater Flow Direction

Santa Ynez River Area

Paso Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

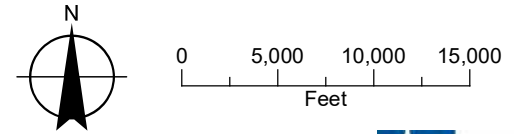
Eastern Management Area Bulletin 118 Boundary

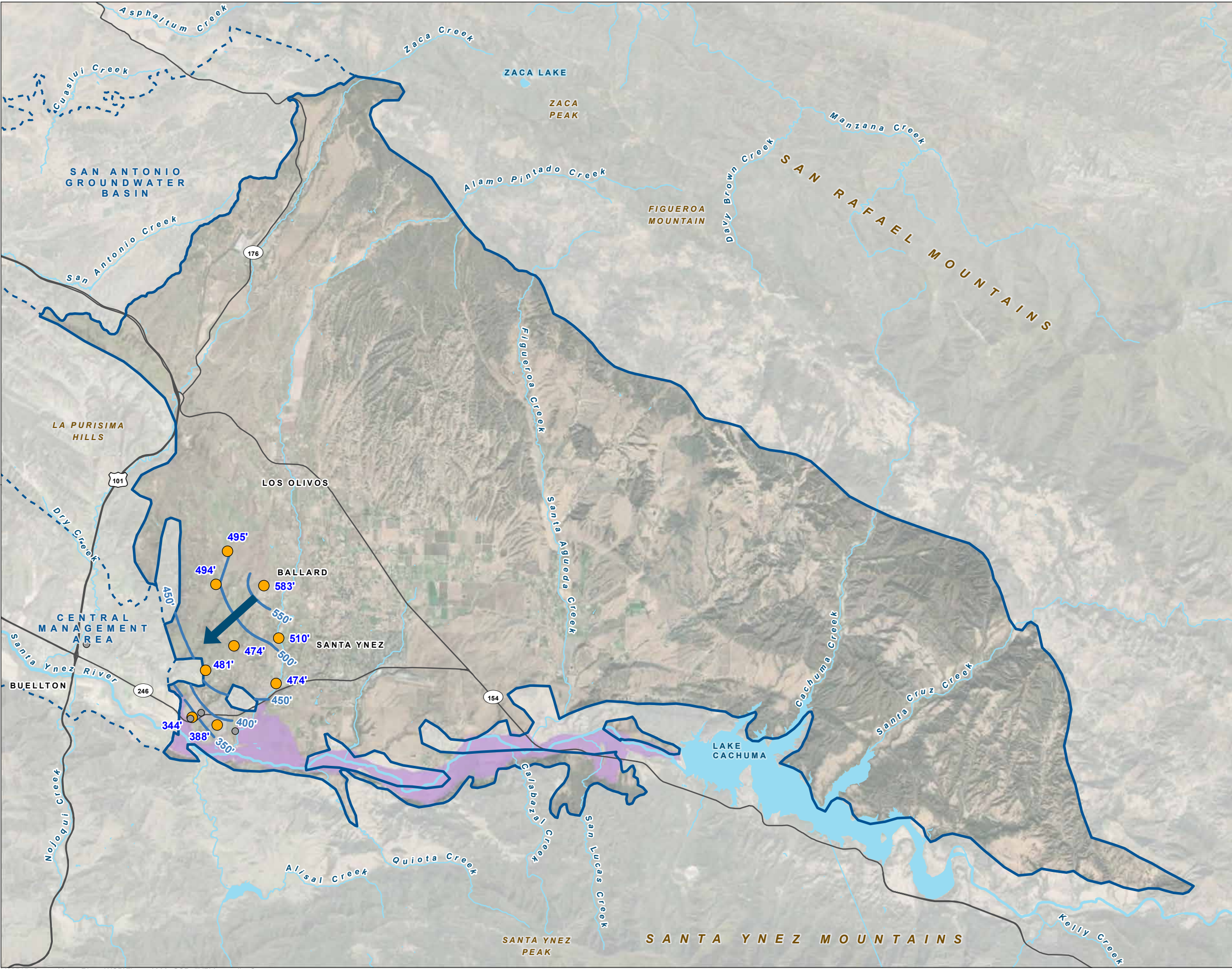
Other Bulletin 118 Groundwater Basin Boundary

Major Road

Watercourse

Waterbody





APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Spring 2020
Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater
Elevation, Spring 2020

Groundwater Flow Direction

Santa Ynez River Area

Careaga Sand Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

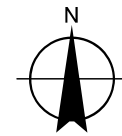
Eastern Management Area Bulletin 118
Boundary

Other Bulletin 118 Groundwater Basin
Boundary

Major Road

Watercourse

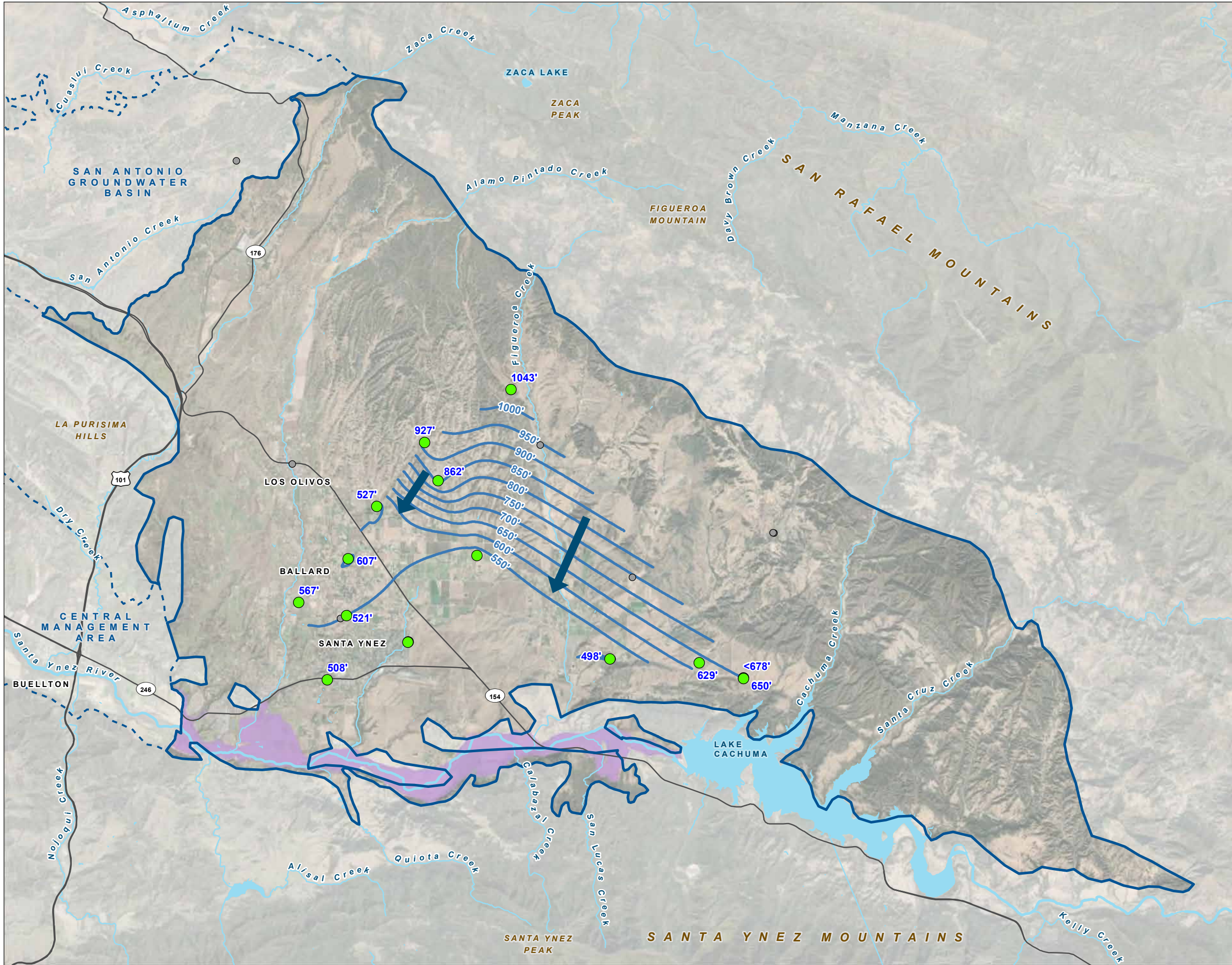
Waterbody



0 5,000 10,000 15,000
Feet



Date: February 25, 2022
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C

Paso Robles Formation Groundwater Elevation Contours, Fall 2020

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater
Elevation, Fall 2020

Groundwater Flow Direction

Santa Ynez River Area

Paso Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

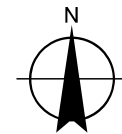
Eastern Management Area Bulletin 118
Boundary

Other Bulletin 118 Groundwater Basin
Boundary

Major Road

Watercourse

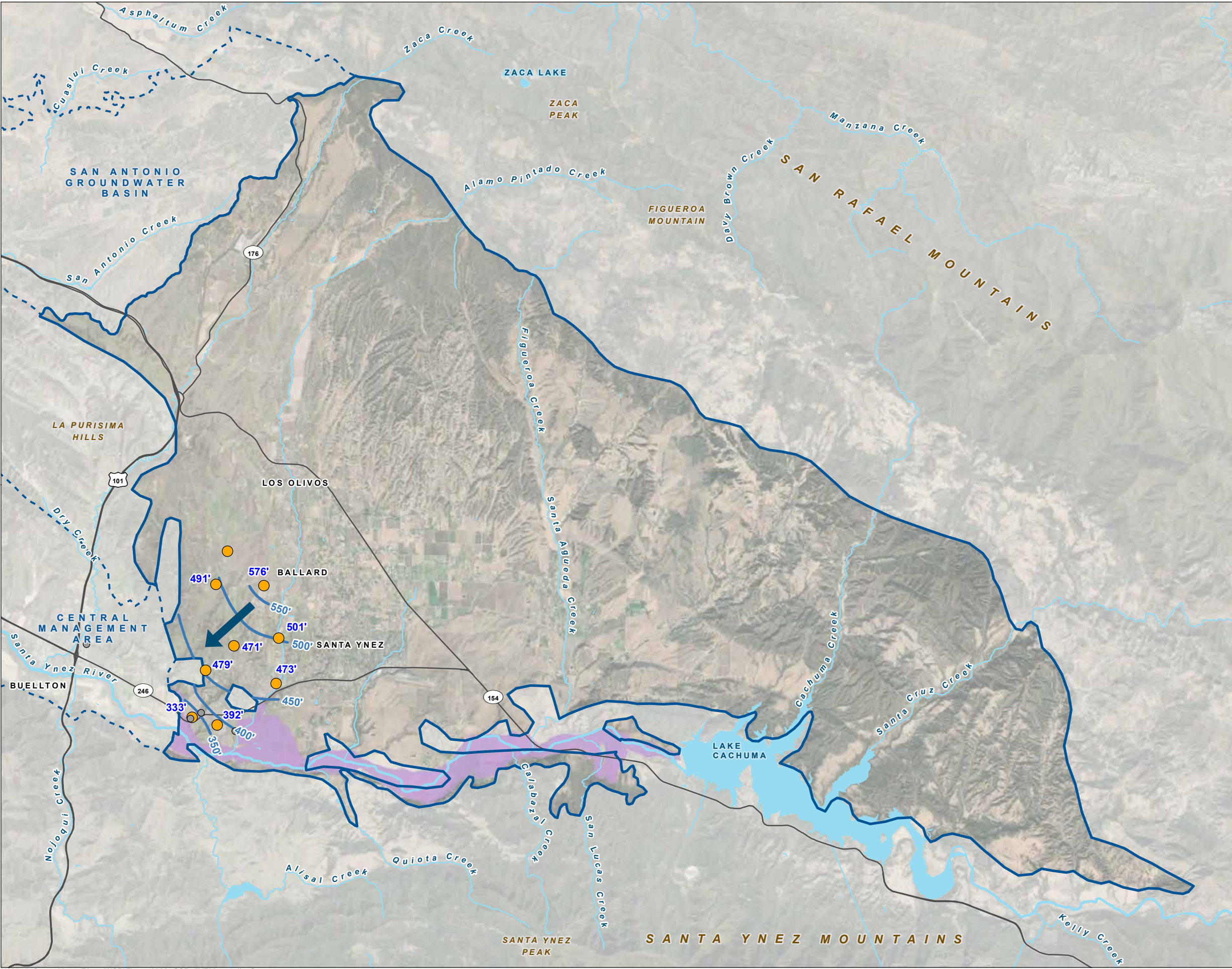
Waterbody



0 5,000 10,000 15,000
Feet



Date: February 25, 2022
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Fall 2020

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater
Elevation, Fall 2020

Groundwater Flow Direction

Santa Ynez River Area

Careaga Sand Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

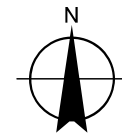
Eastern Management Area Bulletin 118
Boundary

Other Bulletin 118 Groundwater Basin
Boundary

Major Road

Watercourse

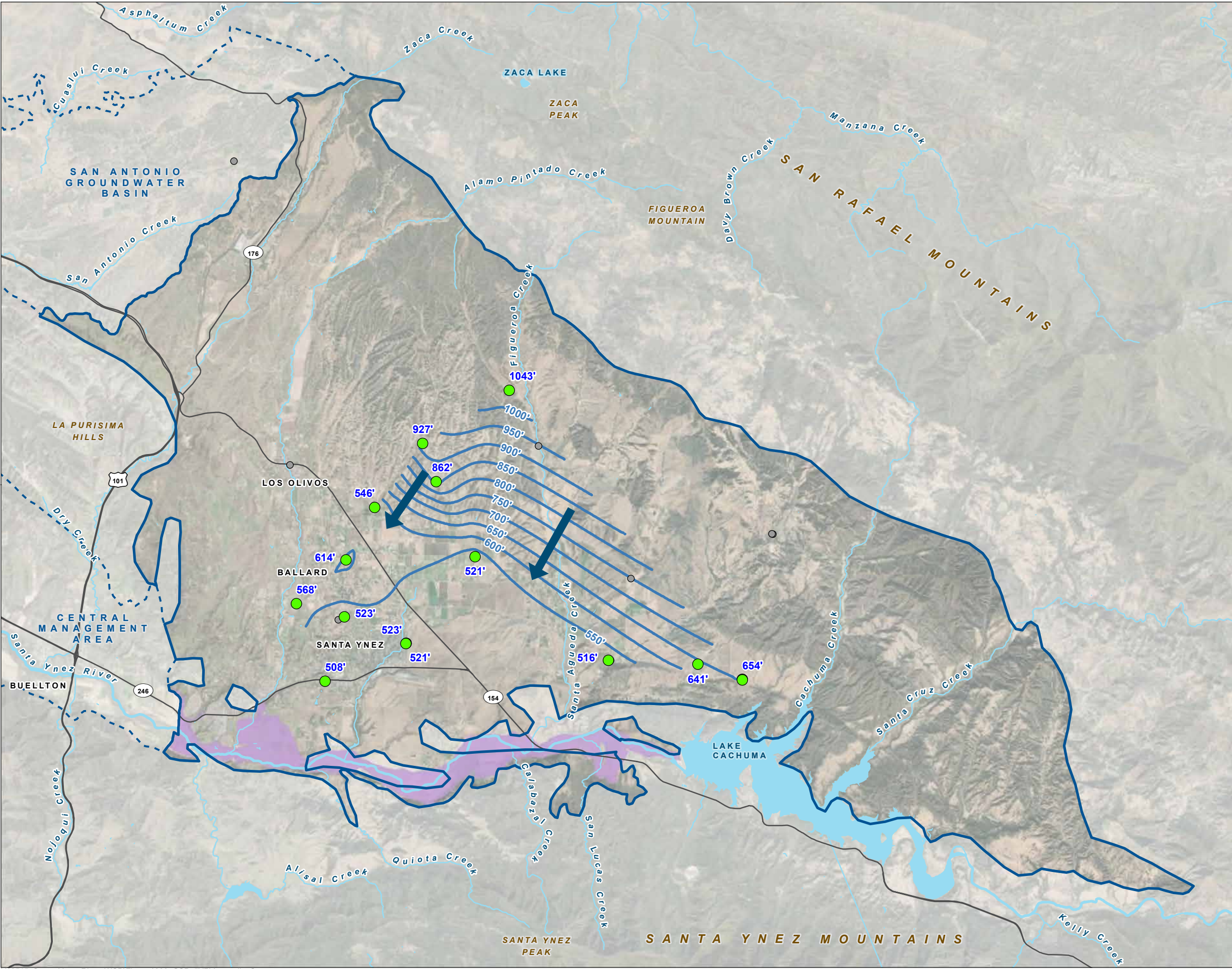
Waterbody



0 5,000 10,000 15,000
Feet



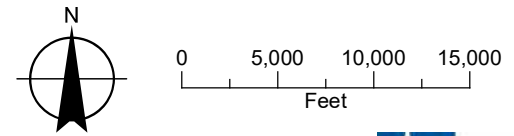
Date: February 25, 2022
Data Sources: ESRI, USGS, Maxar Imagery (2020) Water Solutions, Inc.



APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Spring 2021

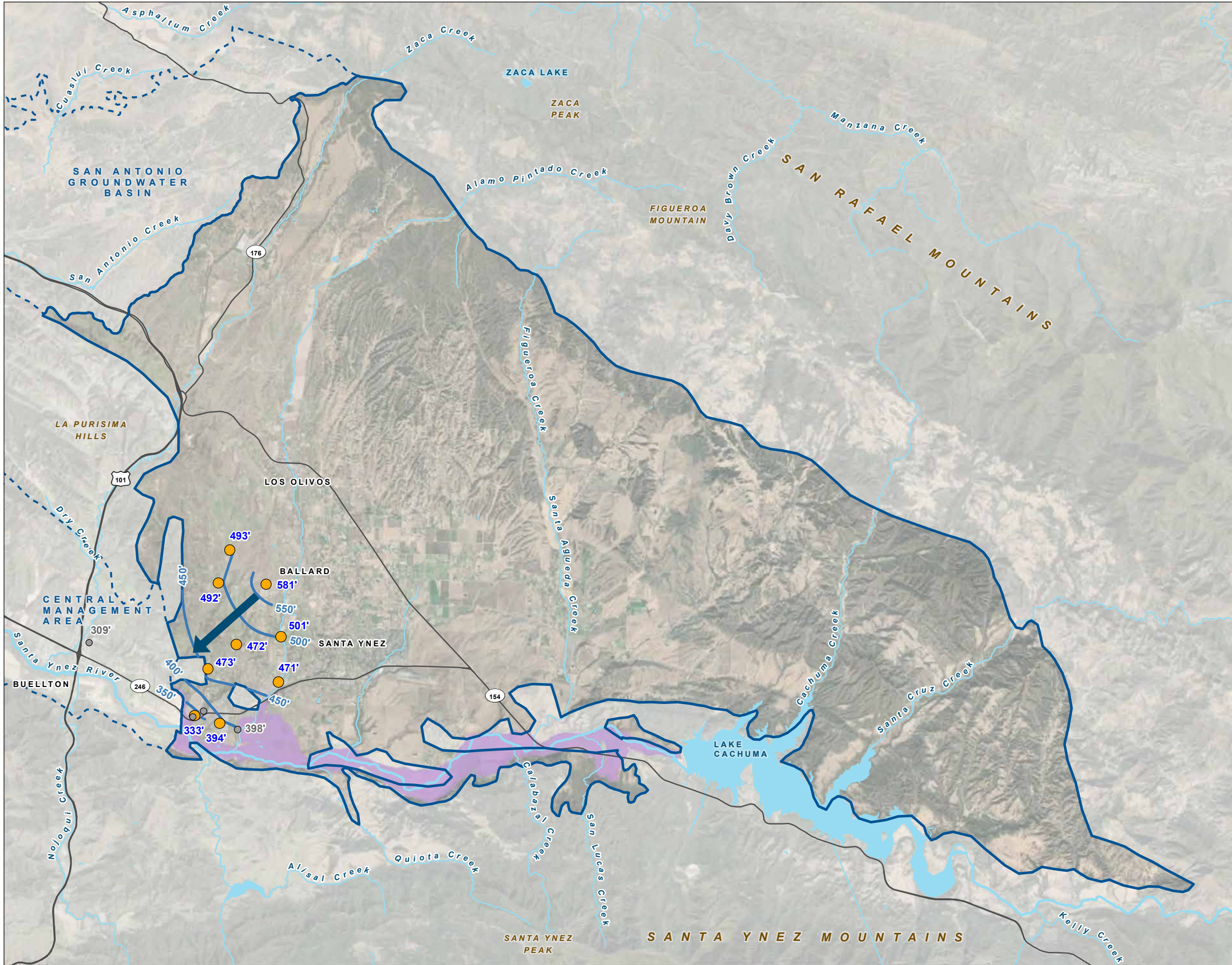
Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

- LEGEND**
- Paso Formation Groundwater Elevation, Spring 2021
 - Groundwater Flow Direction
 - Santa Ynez River Area
 - Paso Formation Wells**
 - Representative Well
Water Level Elevaton (feet)
 - Other Well
Water Level Elevaton (feet)
 - All Other Features**
 - Eastern Management Area Bulletin 118 Boundary
 - Other Bulletin 118 Groundwater Basin Boundary
 - Major Road
 - Watercourse
 - Waterbody



Date: February 25, 2022
Data Sources: ESRI, USGS, Maxar Imagery (2020)





APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Spring 2021
Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater
Elevation, Spring 2021

Groundwater Flow Direction

Santa Ynez River Area

Careaga Sand Formation Wells

Representative Well
Water Level Elevaton (feet)

Other Well
Water Level Elevaton (feet)

All Other Features

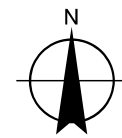
Eastern Management Area Bulletin 118
Boundary

Other Bulletin 118 Groundwater Basin
Boundary

Major Road

Watercourse

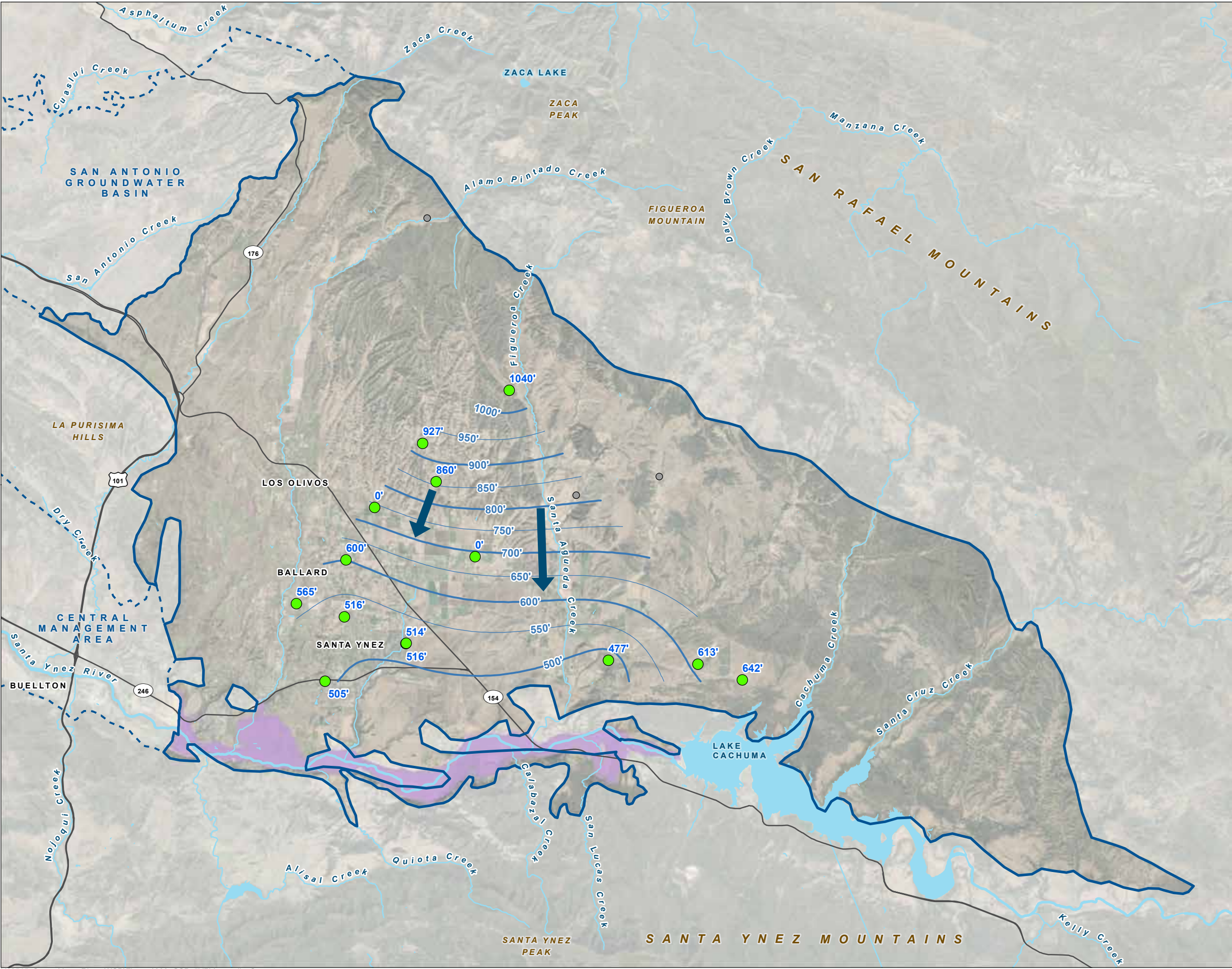
Waterbody



0 5,000 10,000 15,000
Feet



Date: March 18, 2022
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C

Paso Robles Formation Groundwater Elevation Contours, Fall 2021

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater Elevation, Fall 2021

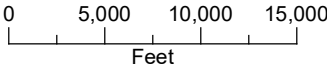
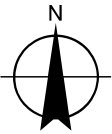
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area

Paso Formation Wells

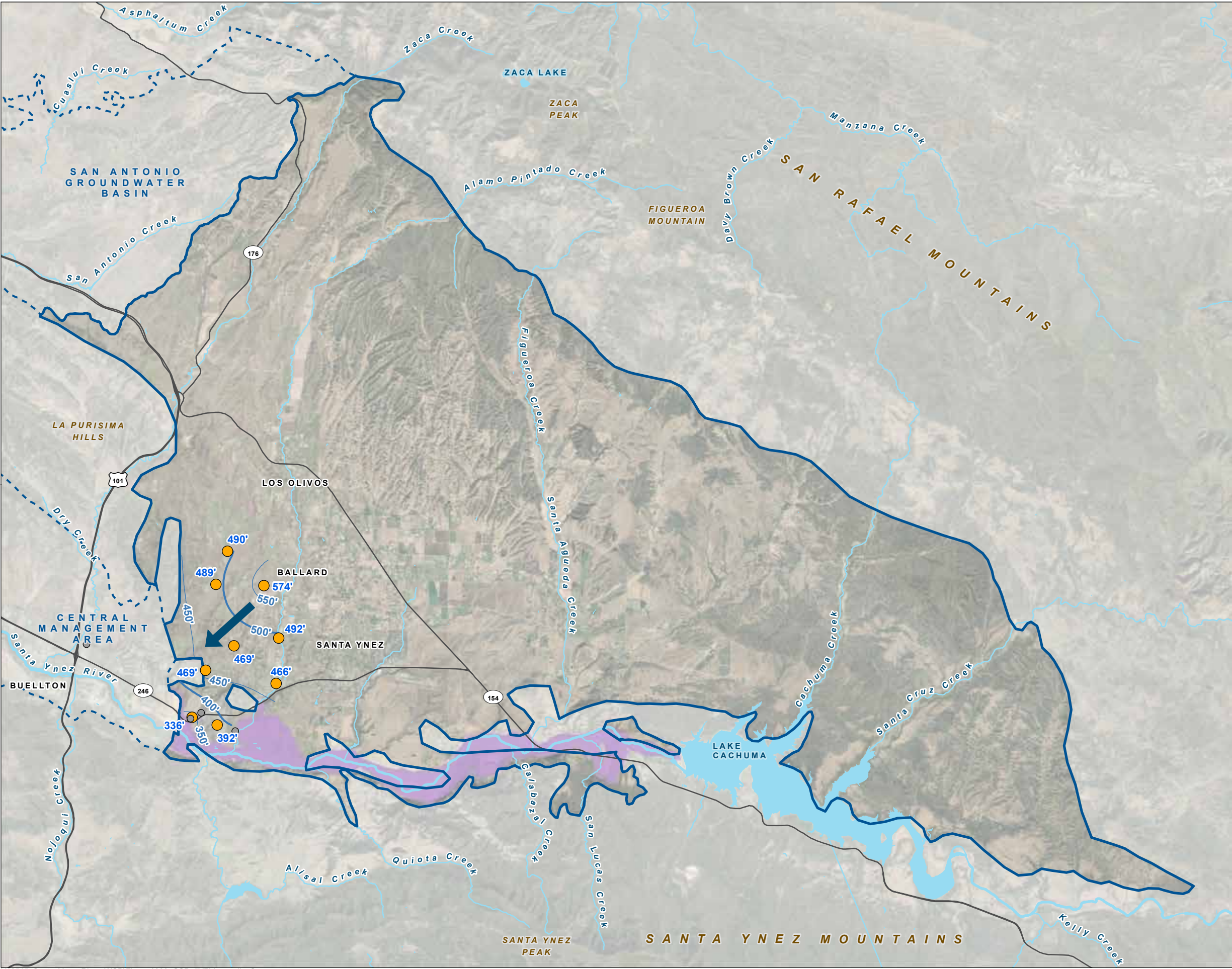
- Representative Well
Water Level Elevaton (feet)
- Other Well
Water Level Elevaton (feet)

All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



Date: March 9, 2023
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Fall 2021

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

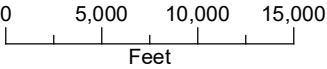
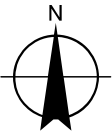
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**Careaga Sand Groundwater
Elevation, Fall 2021**

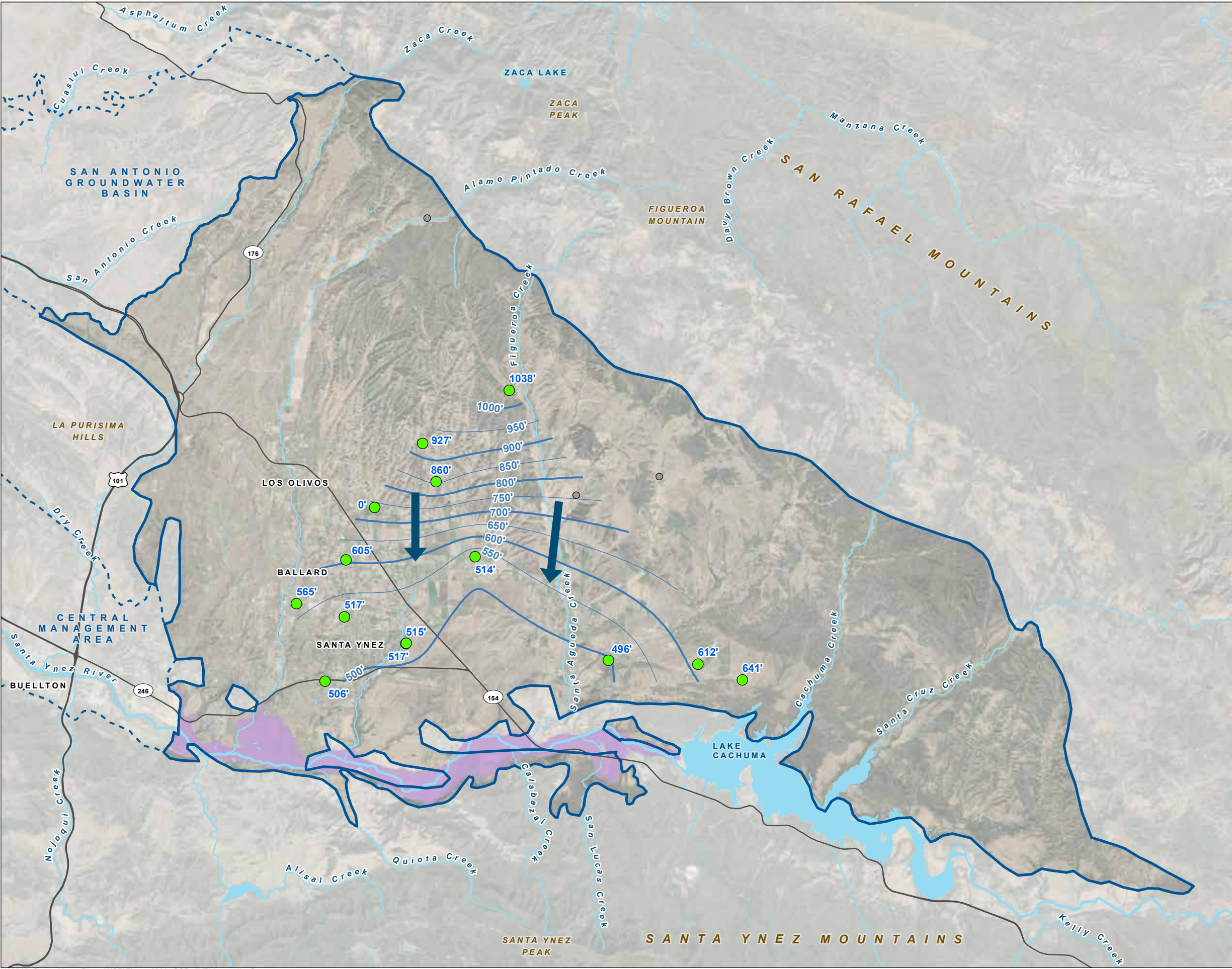
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area
- Careaga Sand Formation Wells
 - Representative Well
Water Level Elevaton (feet)
 - Other Well
Water Level Elevaton (feet)

All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



Date: March 9, 2023
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Spring 2022

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

**Paso Formation Groundwater
Elevation, Spring 2022**

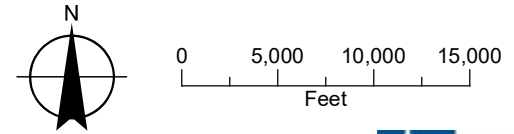
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area

Paso Formation Wells

- Representative Well
Water Level Elevaton (feet)
- Other Well
Water Level Elevaton (feet)

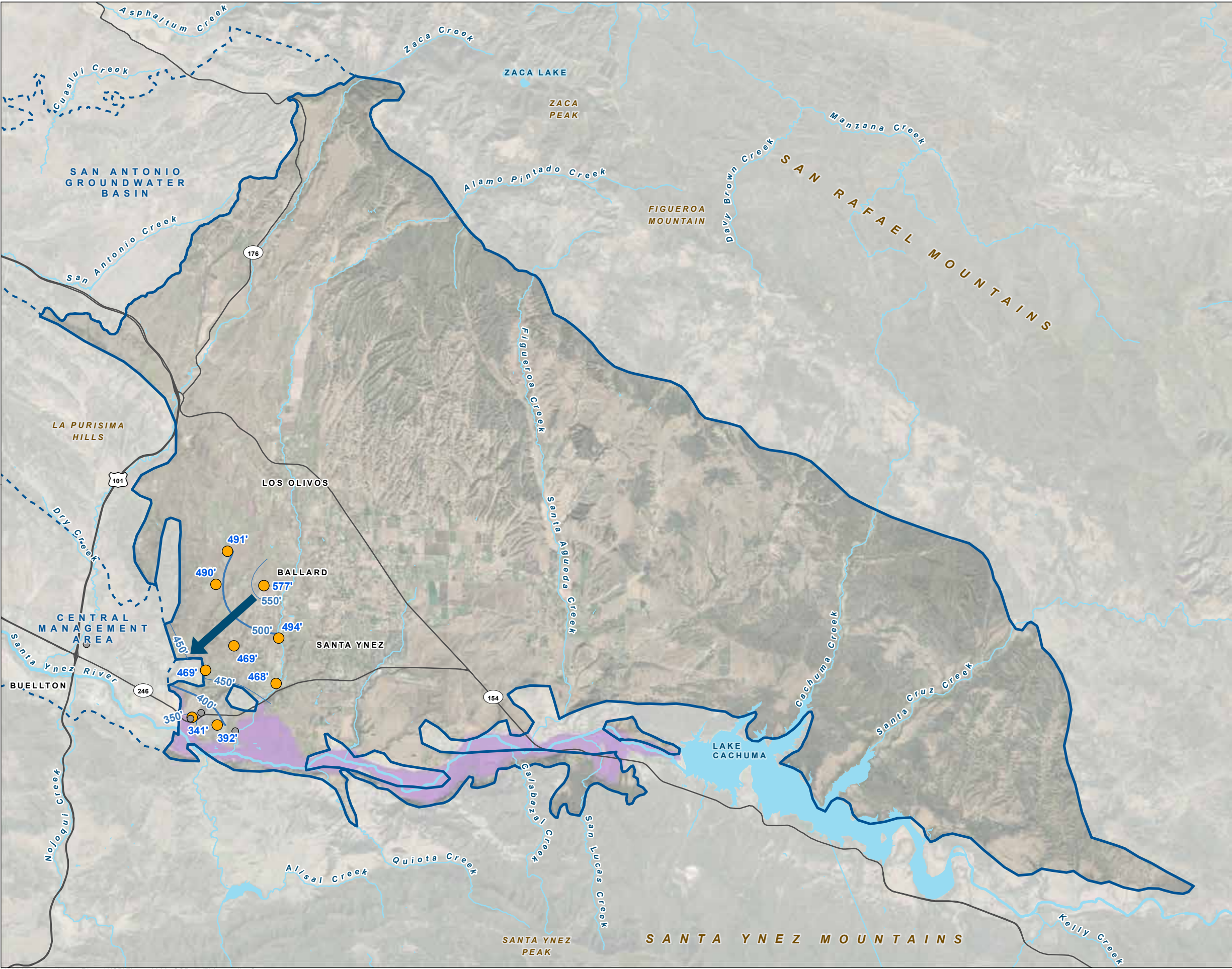
All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



Date: March 9, 2023
Data Sources: ESRI, USGS, Maxar Imagery (2020)





APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Spring 2022

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

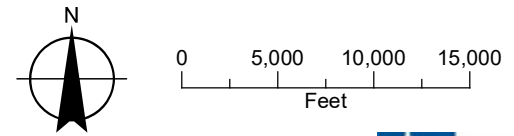
LEGEND

**Careaga Sand Groundwater
Elevation, Spring 2022**

- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area
- Careaga Sand Formation Wells
 - Representative Well
Water Level Elevaton (feet)
 - Other Well
Water Level Elevaton (feet)

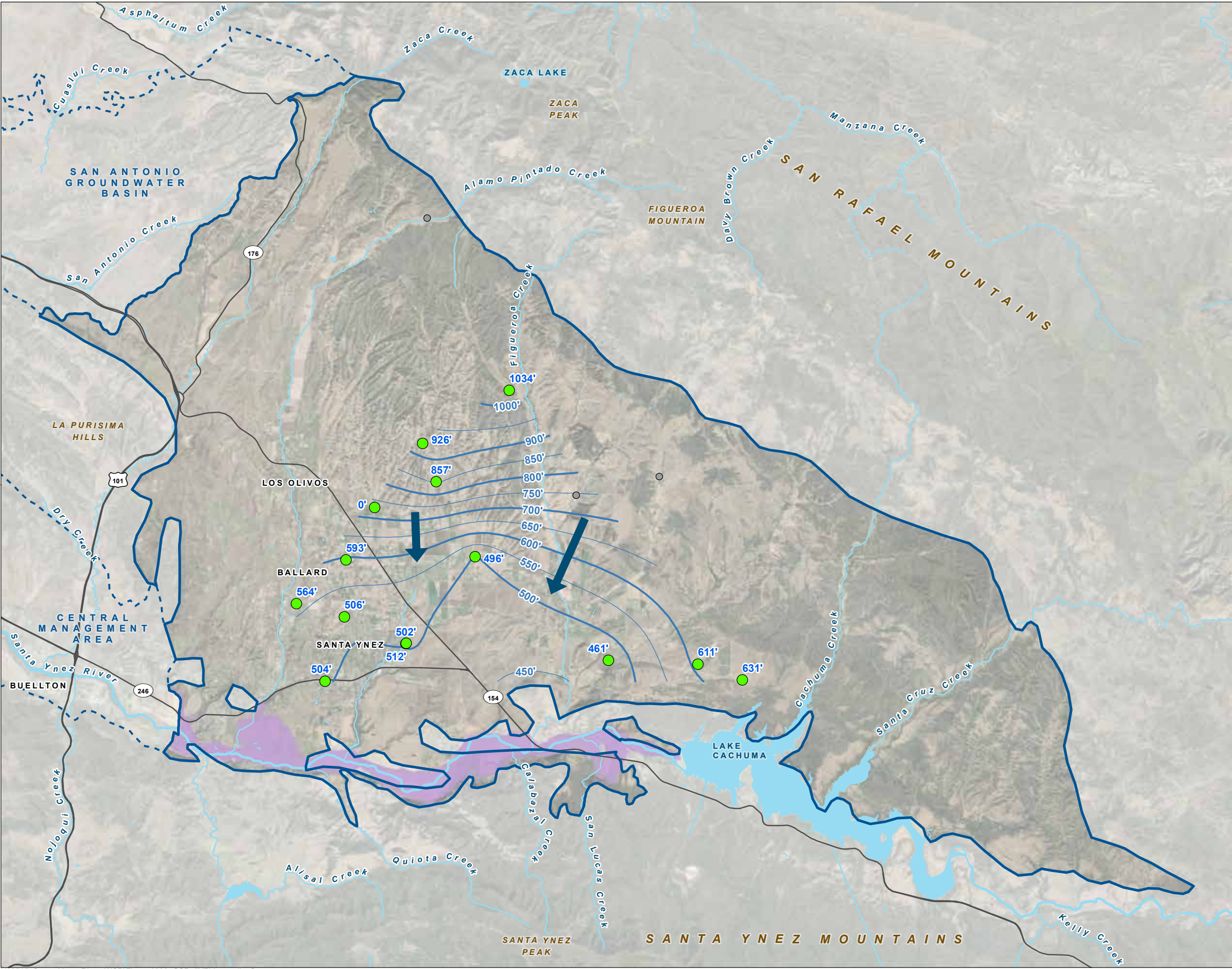
All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



Date: March 9, 2023
Data Sources: ESRI, USGS, Maxar Imagery (2020)





APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Fall 2022

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater
Elevation, Fall 2022

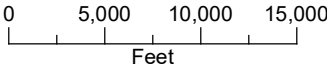
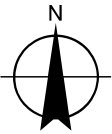
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area

Paso Formation Wells

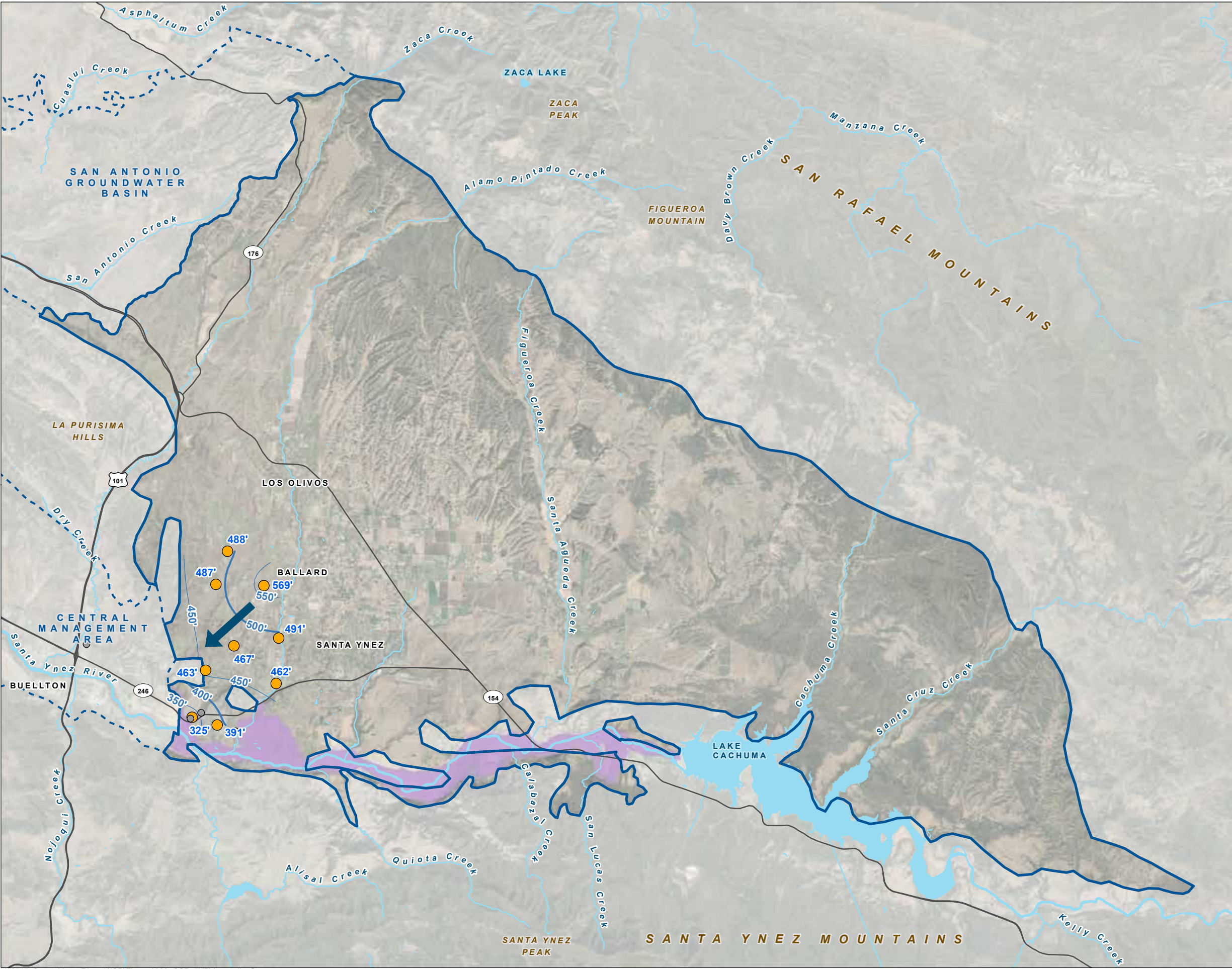
- Representative Well
Water Level Elevaton (feet)
- Other Well
Water Level Elevaton (feet)

All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



Date: March 9, 2023
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Fall 2022

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

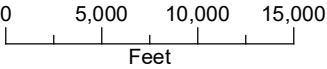
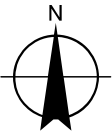
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**Careaga Sand Groundwater
Elevation, Fall 2022**

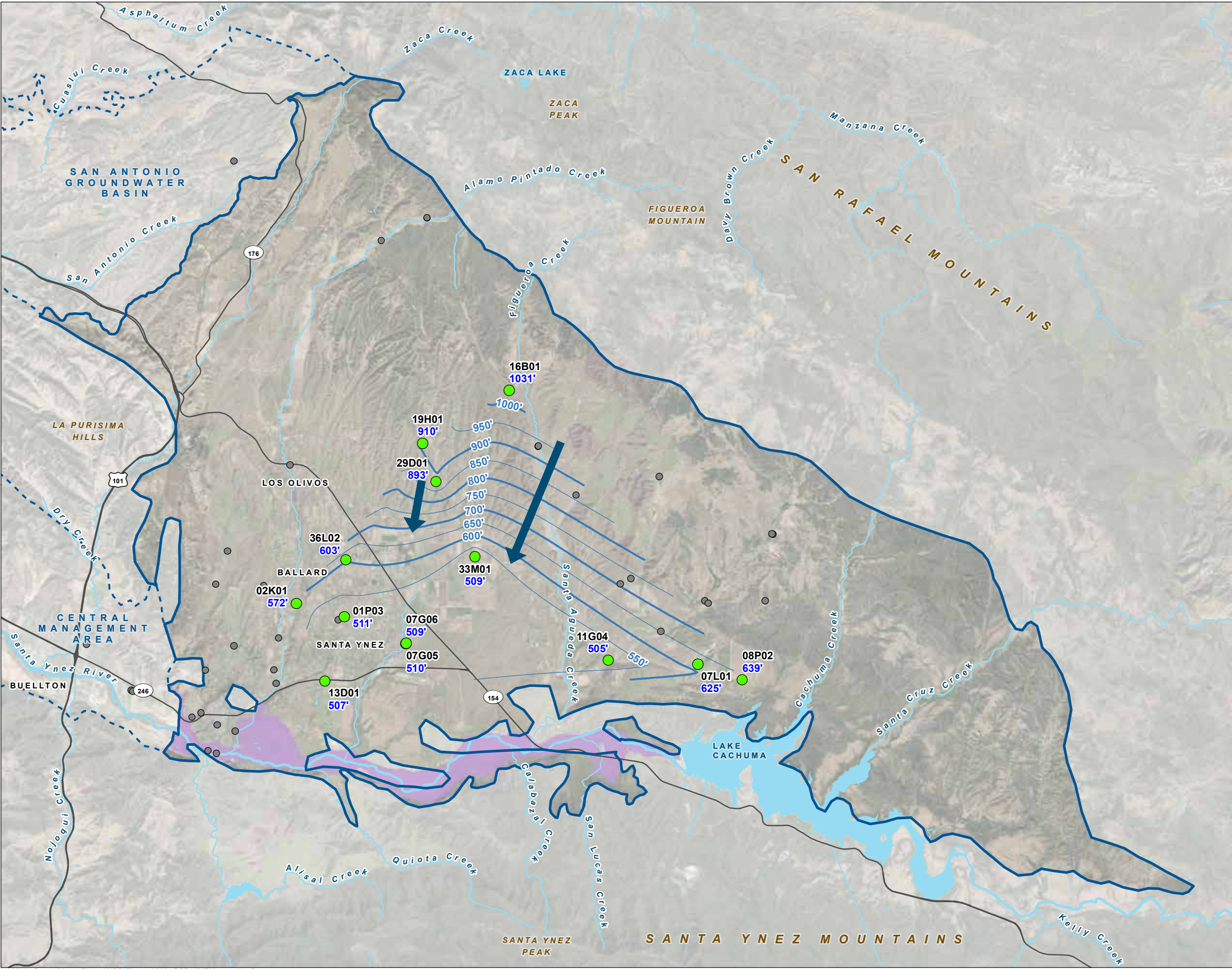
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area
- Careaga Sand Formation Wells**
 - Representative Well
Water Level Elevaton (feet)
 - Other Well
Water Level Elevaton (feet)

All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



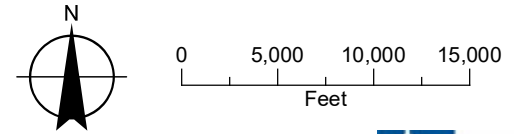
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Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Spring 2023

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

- LEGEND**
- Paso Formation Groundwater Elevation, Spring 2023**
- Major
 - Minor
 - Groundwater Flow Direction
 - Santa Ynez River Area
- Representative Well (by screened aquifer)**
- Paso Robles Formation
Water Level Elevaton (feet NAVD 88)
 - Monitored by Santa Barbara County Water Agency
- All Other Features**
- Eastern Management Area Bulletin 118 Boundary
 - Other Bulletin 118 Groundwater Basin Boundary
 - Major Road
 - Watercourse
 - Waterbody



Date: March 1, 2024
Data Sources: ESRI, USGS, Maxar Imagery (2020)



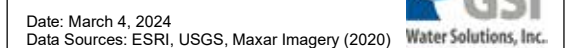
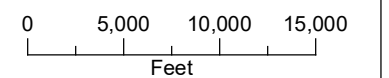
Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

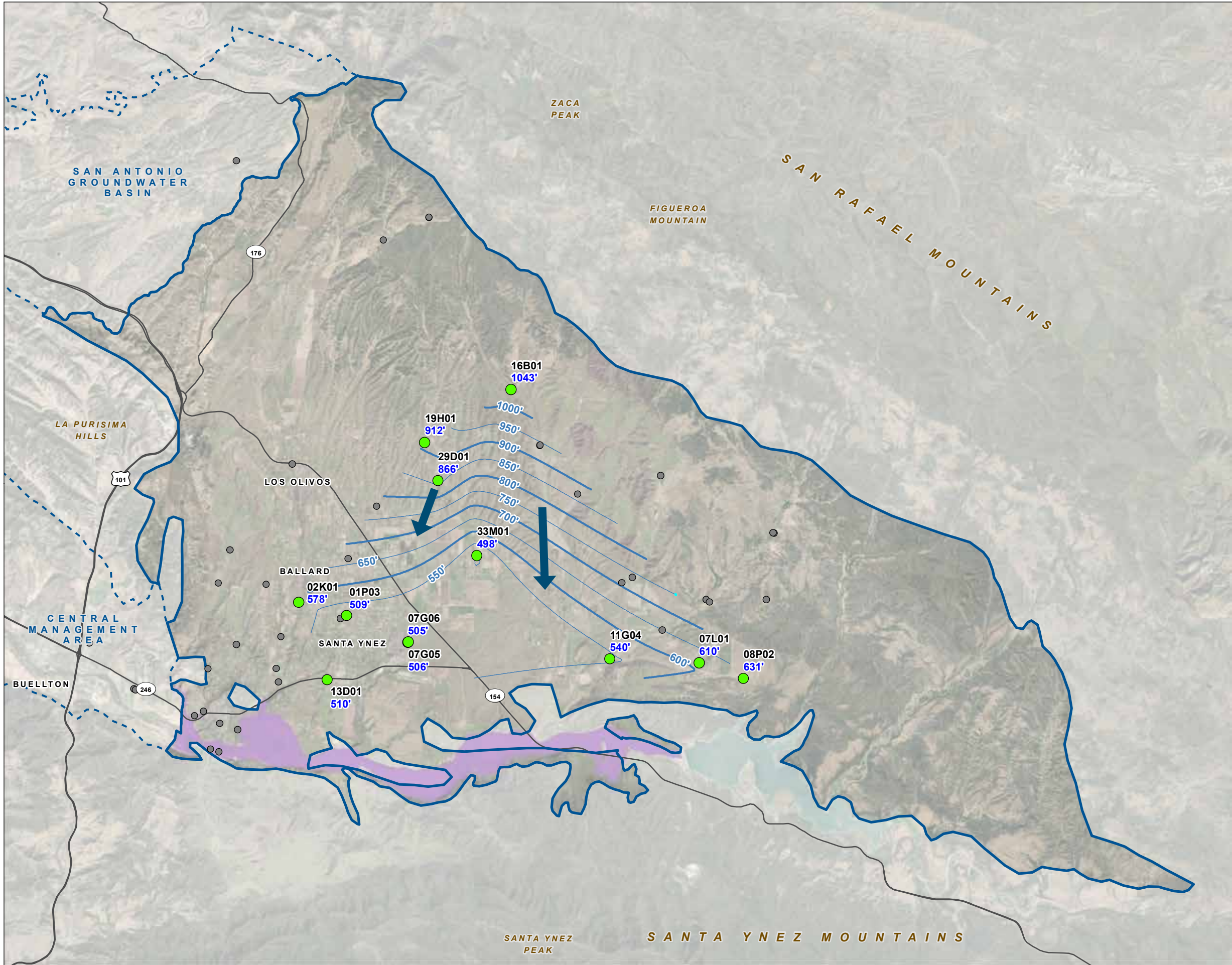
Careaga Sand Groundwater
Elevation, Spring 2023

- Representative Well (by screened aquifer)

- ### All Other Features

-  Eastern Management Area Bulletin 118 Boundary
 Other Bulletin 118 Groundwater Basin Boundary
 Major Road
 Watercourse
 Waterbody





APPENDIX C

Paso Robles Formation Groundwater Elevation Contours, Fall 2023

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater Elevation, Fall 2023

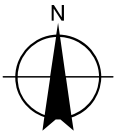
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area

Representative Well (by screened aquifer)

- Paso Formation Well
Water Level Elevaton (feet NAVD 88)
- Monitored by Santa Barbara County
Water Agency

All Other Features

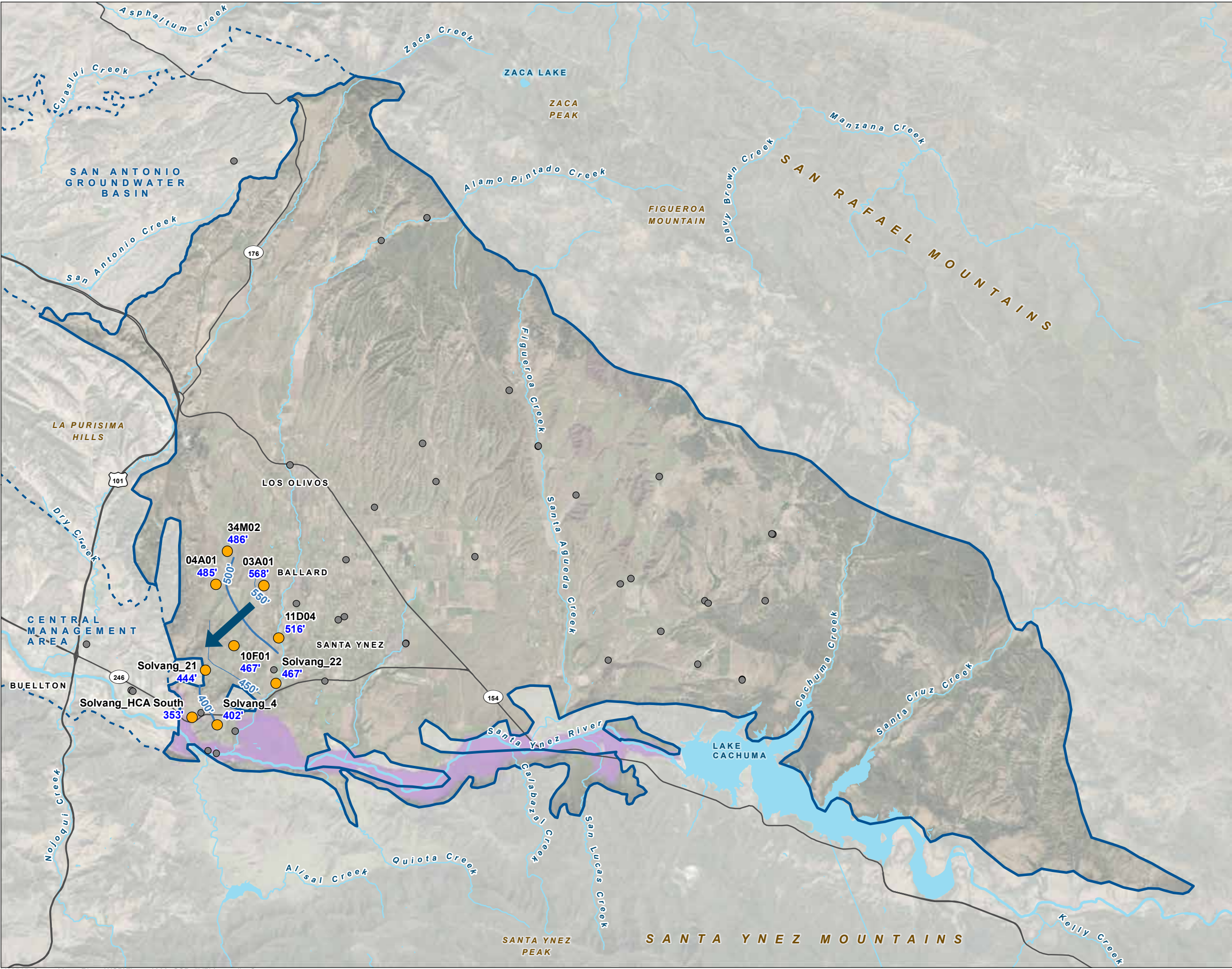
- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



0 5,000 10,000 15,000
Feet



Date: March 1, 2024
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Fall 2023

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater
Elevation, Spring 2023

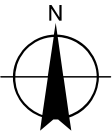
- Major
- Minor
- Groundwater Flow Direction
- Santa Ynez River Area

Representative Well (by screened aquifer)

- Careaga Sand
Water Level Elevaton (feet NAVD 88)
- Monitored by Santa Barbara County
Water Agency

All Other Features

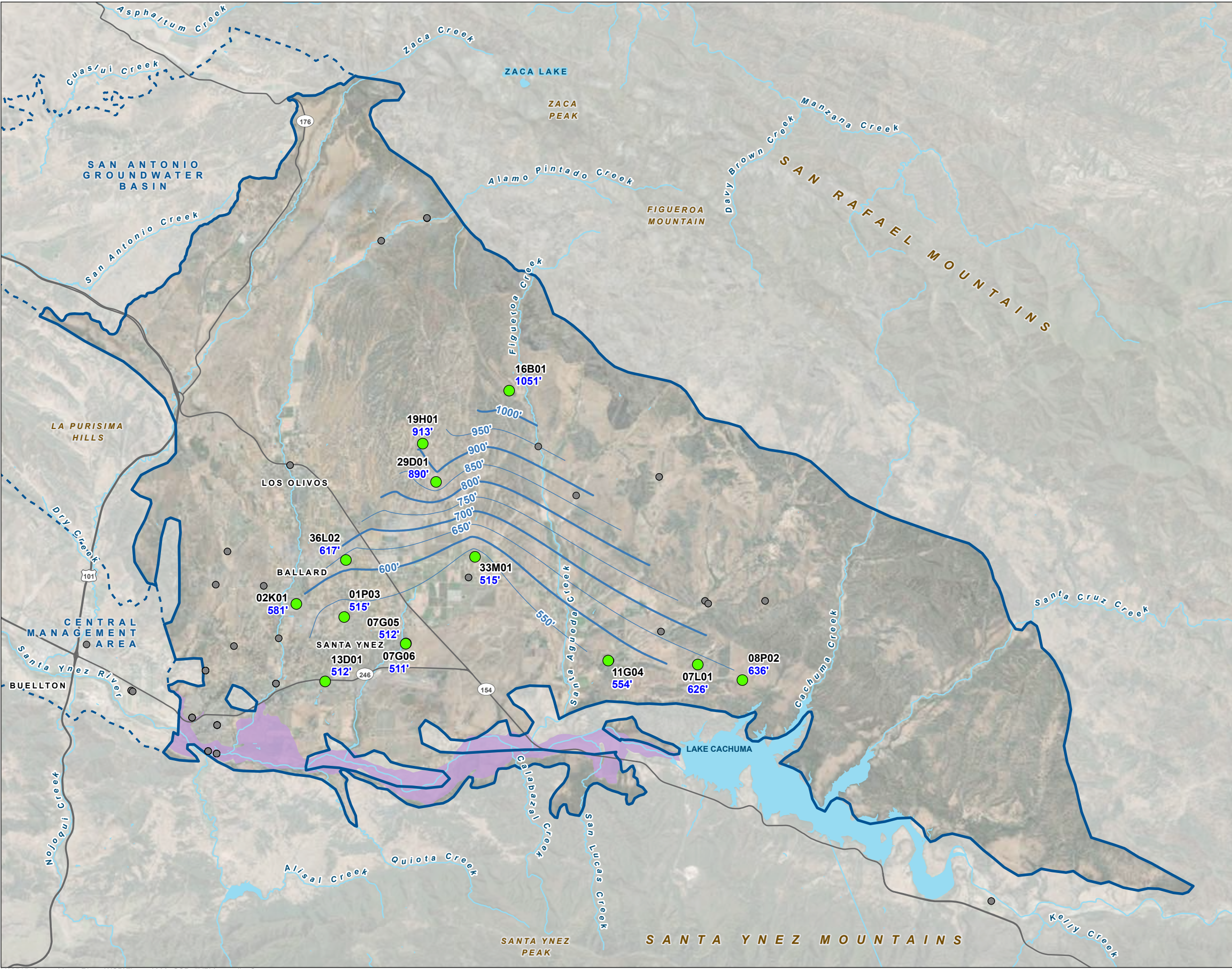
- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



0 5,000 10,000 15,000
Feet



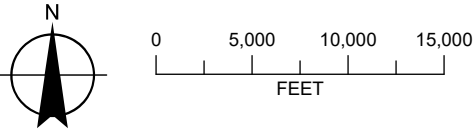
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Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Paso Robles Formation
Groundwater Elevation Contours,
Spring 2024

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

- LEGEND**
- Paso Formation Groundwater Elevation, Spring 2024**
- Major
 - Minor
 - Santa Ynez River Area
- Representative Well (by screened aquifer)**
- Paso Robles Formation
Water Level Elevaton (feet NAVD 88)
 - Monitored by Santa Barbara County Water Agency
- All Other Features**
- Eastern Management Area Bulletin 118 Boundary
 - Other Bulletin 118 Groundwater Basin Boundary
 - Major Road
 - Watercourse
 - Waterbody



APPENDIX C

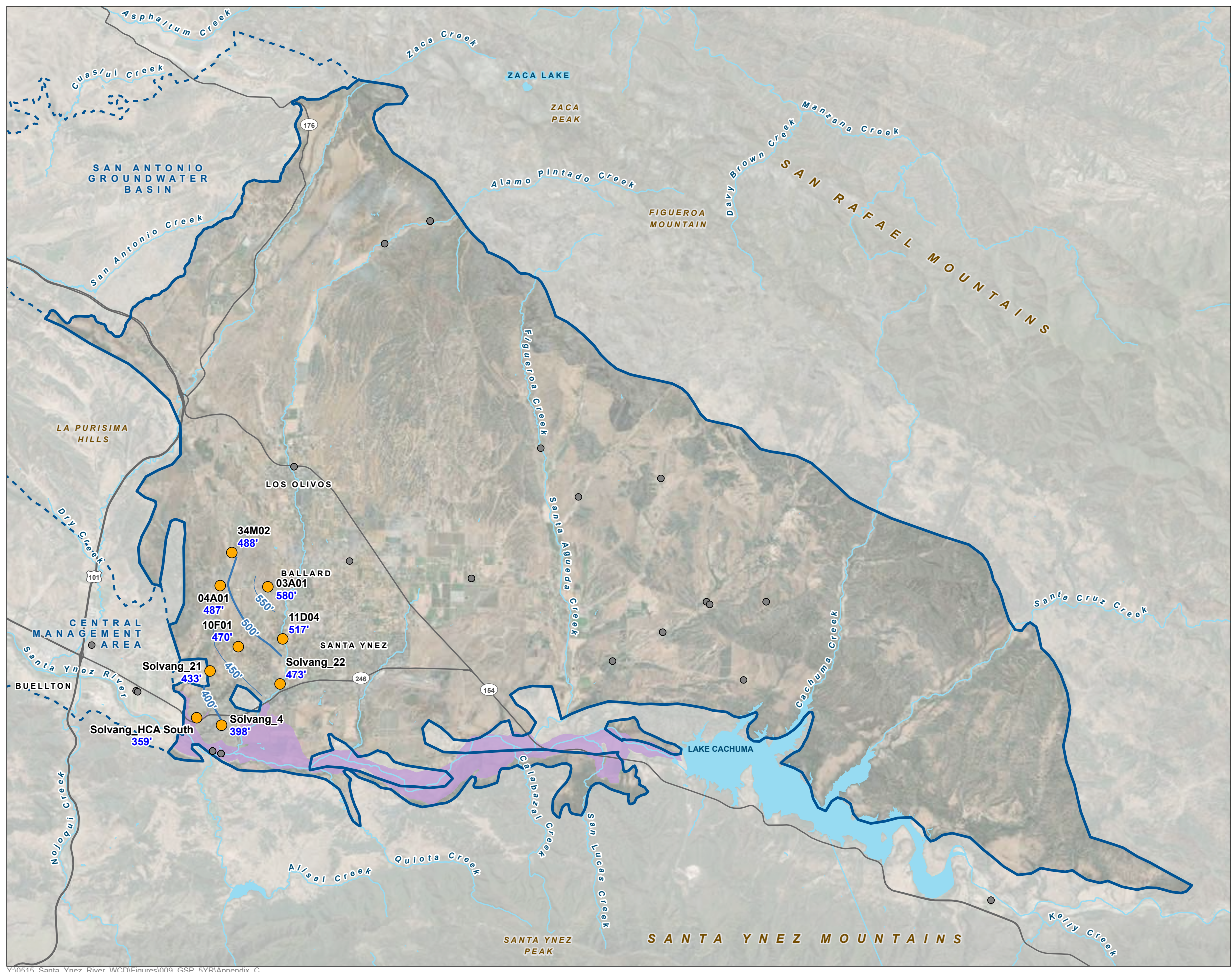
Careaga Sand Groundwater Elevation Contours, Spring 2024

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater
Elevation, Spring 2024

- Major
 - Minor
 - Santa Ynez River Area
- Representative Well (by screened aquifer)**
- Careaga Sand
Water Level Elevaton (feet NAVD 88)
 - Monitored by Santa Barbara County
Water Agency
- All Other Features**
- Eastern Management Area Bulletin 118
Boundary
 - Other Bulletin 118 Groundwater Basin
Boundary
 - Major Road
 - Watercourse
 - Waterbody



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Date: February 23, 2026

Data Sources: ESRI, USGS, Maxar Imagery (2020)

Water Solutions, Inc.

APPENDIX C

Paso Robles Formation Groundwater Elevation Contours, Fall 2024

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Paso Formation Groundwater
Elevation, Fall 2024

- Major
- Minor

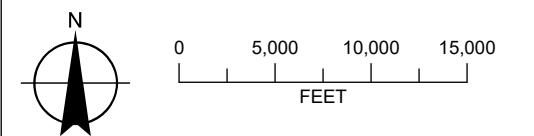
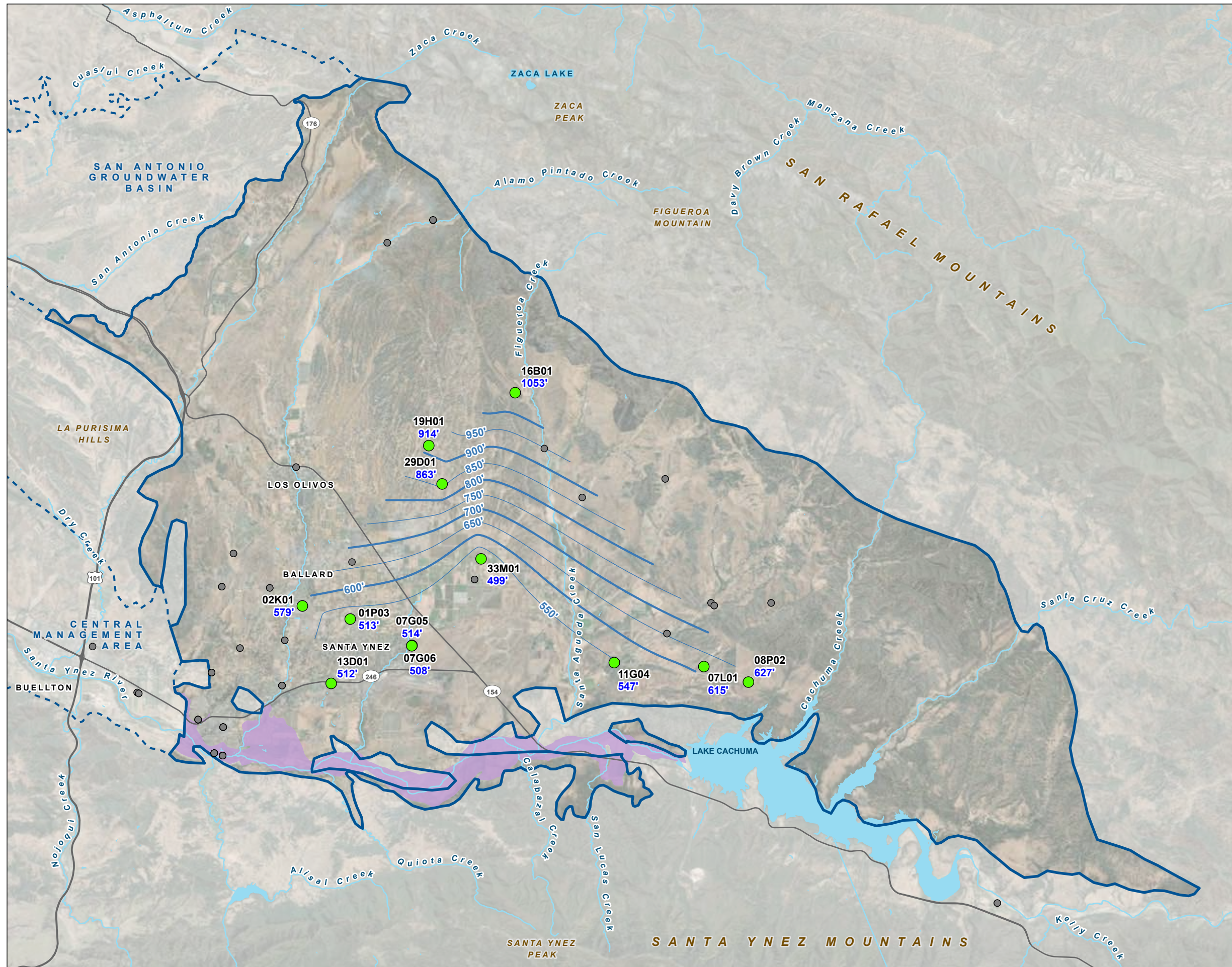
Santa Ynez River Area

Representative Well (by screened aquifer)

- Paso Formation Well
Water Level Elevaton (feet NAVD 88)
- Monitored by Santa Barbara County
Water Agency

All Other Features

- Eastern Management Area Bulletin 118
Boundary
- Other Bulletin 118 Groundwater Basin
Boundary
- Major Road
- Watercourse
- Waterbody



Date: February 23, 2026
Data Sources: ESRI, USGS, Maxar Imagery (2020)



APPENDIX C
Careaga Sand
Groundwater Elevation Contours,
Fall 2024

Santa Ynez River Valley
Groundwater Basin
Eastern Management Area
Groundwater Sustainability Plan
Periodic Evaluation

LEGEND

Careaga Sand Groundwater Elevation, Fall 2024

Major
Minor

Santa Ynez River Area

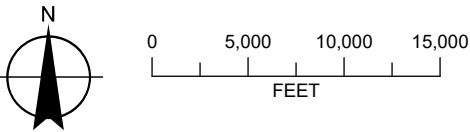
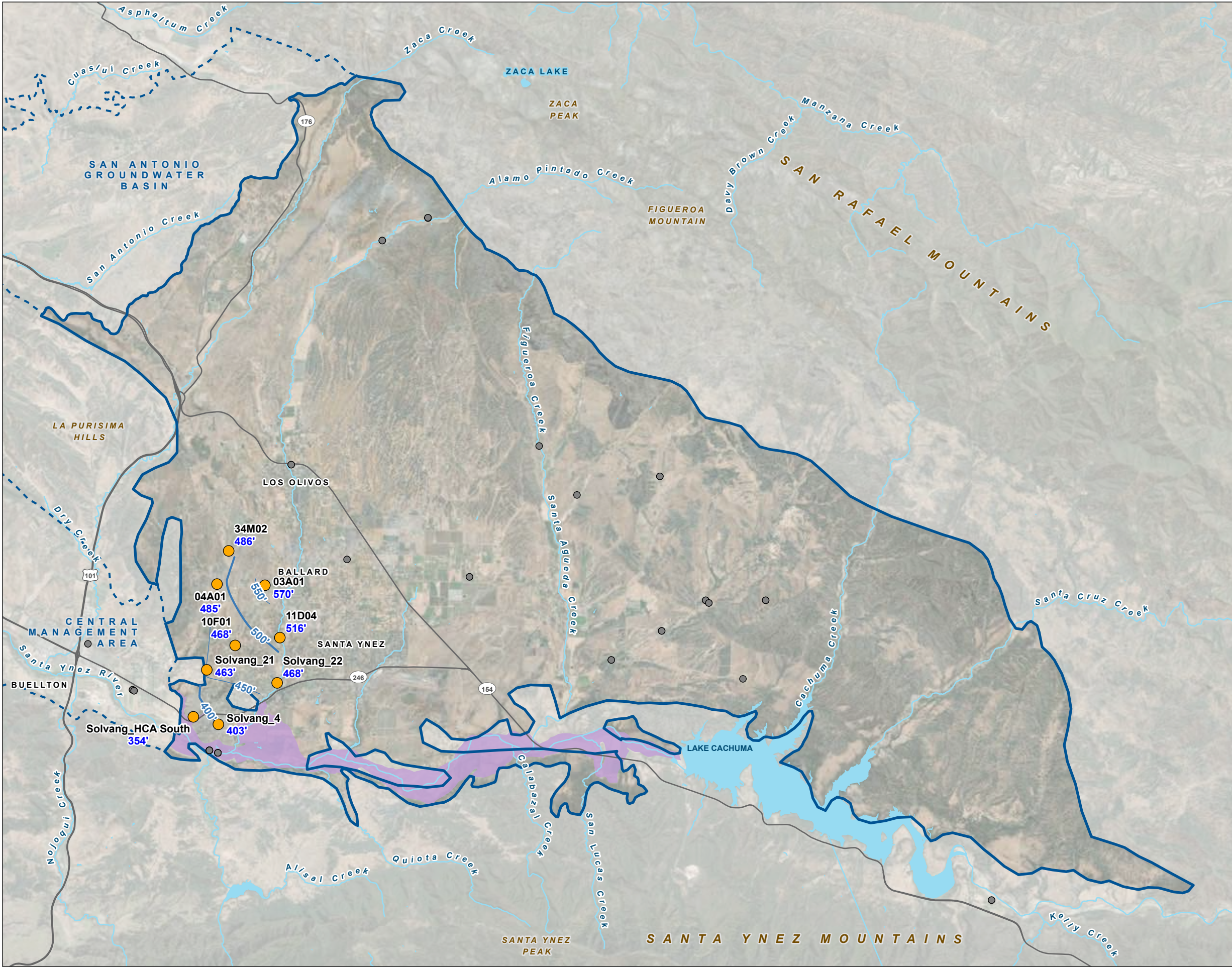
Representative Well (by screened aquifer)

Careaga Sand
Water Level Elevaton (feet NAVD 88)

Monitored by Santa Barbara County Water Agency

All Other Features

Eastern Management Area Bulletin 118 Boundary
Other Bulletin 118 Groundwater Basin Boundary
Major Road
Watercourse
Waterbody



APPENDIX D

Joint Presentation of Santa Ynez River Valley Groundwater Basin
Water Budgets Showing Consistency



DRAFT TECHNICAL MEMORANDUM

2171 E. Francisco Blvd., Suite K • San Rafael, California • 94901

TEL: (415) 457-0701 FAX: (415) 457-1638

TO: File

DATE: July 15, 2026

FROM: Stetson Engineers

RE: **DRAFT** Joint Presentation of Santa Ynez River Valley Groundwater Basin Water
Budgets Showing Consistency

SUMMARY

This is a summary presentation of the water budget for the Santa Ynez River Valley Groundwater Basins (“SYRVGB”), DWR Basin No. 3-15. The historical period of 1982–2018 was coordinated throughout the SYRVGB. This document is a summary of the water budget information presented separately in the individual 2022 groundwater sustainability plans (“GSPs”) prepared by the Western Management Area (“WMA”), Central Management Area (“CMA”), and Eastern Management Area (“EMA”) groundwater sustainability agencies (“GSAs”) that were each submitted in January 2022 to the California Department of Water Resources (“DWR”).

To the extent that these three management areas are connected, water flows from the EMA into the CMA, and then from the CMA into the WMA, and from the WMA into the Pacific Ocean. Water can flow between these management areas as one of three components:

- **Groundwater Subflow** which are the underground flows between aquifers across management-area boundaries.
- **Santa Ynez River Surface flow** which are aboveground river flows.
- **Santa Ynez River Underflow** which are the underground flows of the Santa Ynez River through its alluvium, a known and definite channel.

Table 1 presents a summary of how key components of the surface water budget compare across the three management areas. **Table 2** summarizes the inflows and outflows across the two management area boundaries.

Table 1
Select Water Budget Components
Historical 1982–2018 Average Flows for each
Santa Ynez River Valley Groundwater Basin
Management Area from 2022 GSPs

Management Area	EMA		CMA		WMA	
Component	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Santa Ynez River Surface Flow	61,600	85,700	85,720	91,320	91,320	89,190
Santa Ynez River Tributary Inflow	27,000	-	9,060	-	16,130	-

Notes:

Values in acre-feet ("AF").

In the GSP, the EMA presented water budget results rounded to nearest 100 AF, the CMA and WMA presented results rounded to nearest 10 AF.

Table 2
Summary of Flows Crossing Boundaries
Historical 1982–2018 Average Flows for each
Santa Ynez River Valley Groundwater Basin
Management Area from 2022 GSPs

Flow Component	Management Area Boundary	Upstream Budget	Downstream Budget	Consistent?
Groundwater Subflow	EMA→CMA	100 AFY	85 AFY	Yes (rounding)
	CMA→WMA*	0 AFY	0 AFY	Yes
SYR Surface Flow	EMA→CMA	85,700 AFY	85,720 AFY	Yes (rounding)
	CMA→WMA	91,320 AFY	91,320 AFY	Yes
SYR Underflow	EMA→CMA	1,800 AFY	1,800 AFY	Yes
	CMA→WMA	800 AFY	800 AFY	Yes

Notes: SYR" means Santa Ynez River, "AFY" is acre-feet per year. Background colors indicate management area: green indicates EMA, sky blue indicates CMA, and blue indicates WMA.

*Currently, the subflow is a data gap, but is expected not to be substantial (less than a 100 acre-feet).

This document provides information about the factors used in estimating the sustainable yield and groundwater change in storage, including time periods, terminologies, and definitions for the physical components of the Basin. The sustainable yield and change in groundwater storage are determined across all three GSAs using key components of the water budget that can be measured or reported (i.e., water-level change and groundwater well production). The sustainable yields and periods are summarized in **Table 3**.

Table 3
Sustainable Yield Estimates for each
Santa Ynez River Valley Groundwater Basin
Management Area from 2022 GSP

Management Area	Analysis Period	Sustainable Yield	Page Location in GSP
EMA	1982–2018	12,870 AFY	3-146, 2022 EMA GSP
CMA	1982–2018	2,800 AFY	2c-55, 2022 CMA GSP
WMA	1982–2018	26,500 AFY	2c-58, 2022 WMA GSP

Note: "AFY" is acre-feet per year. The WMA 2022 GSP pg. 2c-58 states, "This water budget analysis indicates that the perennial yield of the basin is approximately 26,000 to 27,000 AFY."

Broadly this Joint Presentation shows the results of the coordination that occurred between the three GSAs of the SYRVGB:

- Common historical period (1982–2018) used
- Common conceptual model

- Coordinated boundary flows, upstream outflows and downstream inflows are coordinated.
- Consistent sustainable-yield methodology
- Data gaps and related uncertainty are understood and are being addressed.

At the end of this document, additional tables (**Table 10 and Table 11**) summarize the historical (1982–2018) groundwater inflows and outflows from the WMA, CMA, and EMA GSPs (Table 2c.3-6 in the WMA GSP, Table 2c.3-6 in the CMA GSP, and Table 3-27 in the EMA GSP). These tables indicate what portions of the water budget are coordinated and demonstrate consistency.

The following discusses what these components represent and why they are coordinated.

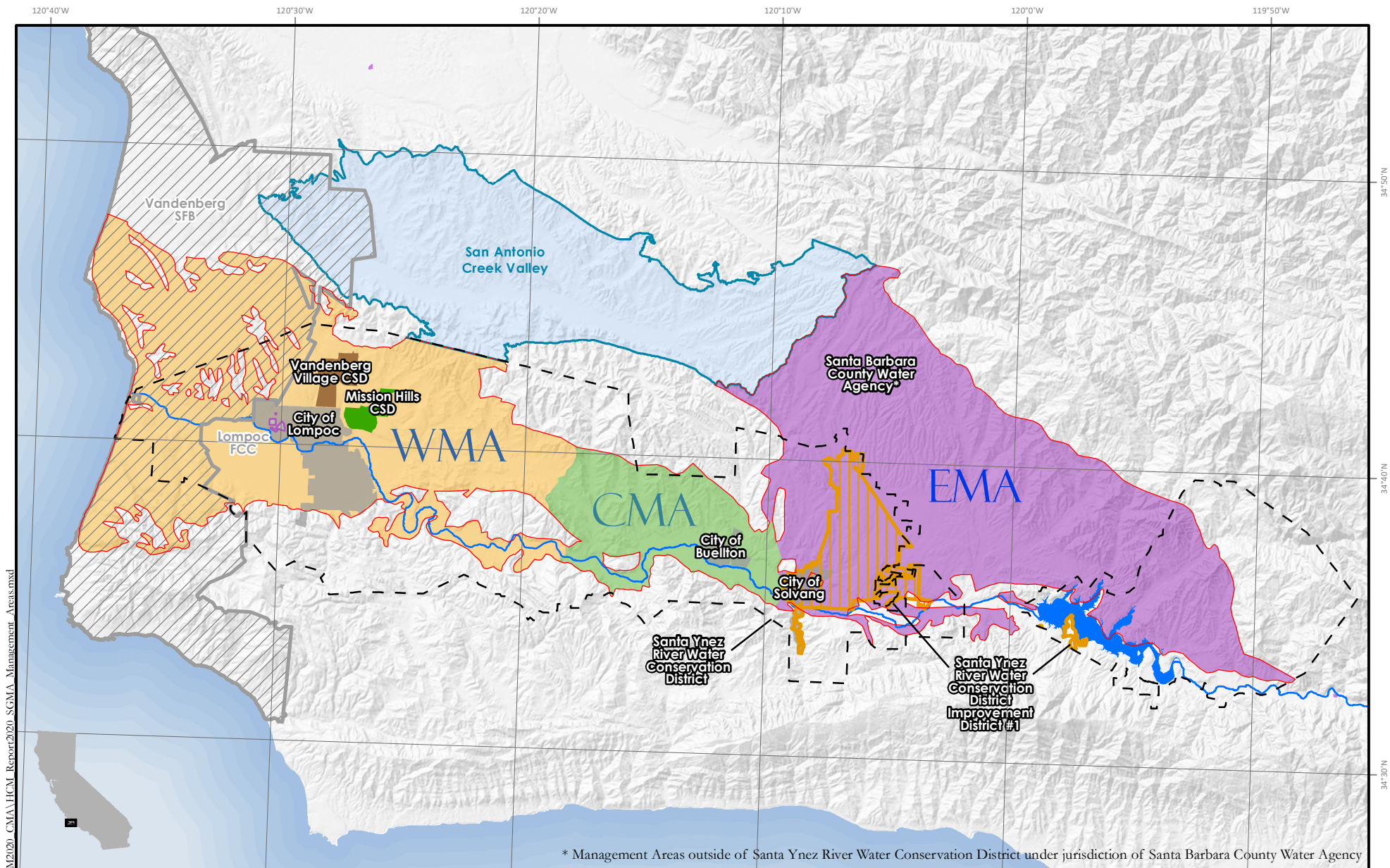
BACKGROUND

The SYRVGB has three independent Groundwater Sustainability Agencies (“GSAs”) for compliance with the Sustainable Groundwater Management Act. The three GSAs are the WMA, CMA, and EMA. Each GSA submitted a Groundwater Sustainability Plan (“GSP”) in January 2022. **Figure 1** shows the location of all three management areas of the Basin.

In its review, the Department of Water Resources (“DWR”) analyzed all three GSPs and the coordination agreement as a single “Plan” (combined total of 3,757 pages). DWR’s Staff Report indicated several specific inconsistencies^{1,2} which, upon review, may have been errors. As part of the January 2024 approval of the Plan, the DWR requested a re-evaluation of the water budgets to address these inconsistencies and a simplified single presentation of the water budget for the entire basin. **Attachment I** is a copy of DWR’s proposed Recommended Corrective Action (“RCA”) with regard to water budgets.

¹ Apparent error in GSP Assessment Staff Report (exclusion of CMA), Page 27: “When comparing surface water outflows from the EMA with inflows to WMA, Department staff noted that surface water increased by approximately 6,000 AFY.”

² Apparent error in GSP Assessment Staff Report, Page 27: “Additionally, Department staff note that the WMA used the years 2002-2011 to calculate its sustainable yield while CMA and EMA used 1982-2018.”



-  Western Management Area (WMA)
-  Central Management Area (CMA)
-  Eastern Management Area (EMA)

SANTA YNEZ RIVER VALLEY GROUNDWATER BASIN
(DWR BULLETIN 118 BASIN NO. 3-015)
AND MANAGEMENT AREA BOUNDARIES

DRAFT

0 2 4 Miles

Sources:
 NAIP (2018)
 USGS National Elevation Dataset, 2002
 Groundwater basin boundary from DWR Bulletin 118, 2018



FIGURE 1a.1-3

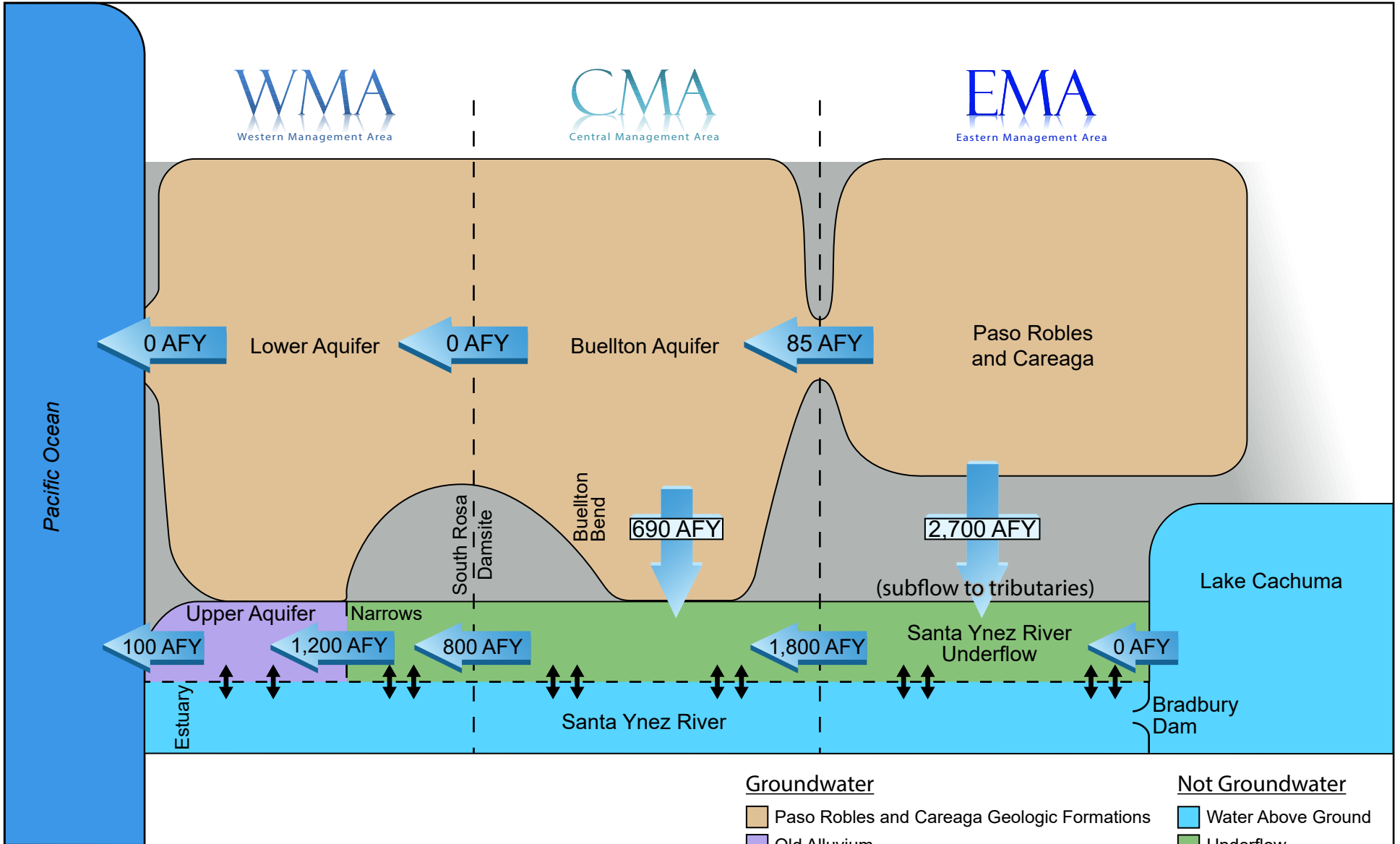
SYRVGB CONCEPTUAL FRAMEWORK

This document reviews regional-scale accounting and understanding of the lower Santa Ynez River Valley groundwater basins as a single unit. This reviews the water budgets for all three management areas and shows how they consistently assess hydrologic conditions and develop consistent groundwater inflows and outflows.

Analysis at this regional level is abstracted from the local subarea and management areas presented in the GSPs. **Figure 2** is an illustration of a regional conceptual model for the water budget across the entire lower Santa Ynez River Valley. The figure is a conceptual representation, which is a combination of the map view (from above) and cross-section (side view) perspectives to make the topology easier to understand.

Figure 2 shows how the Santa Ynez River flows from Lake Cachuma to the Pacific Ocean. Note that the reach above the Lompoc Narrows, the river alluvium constitutes a known and definite channel and is legally part of the surface water system under SGMA. This water flowing through the shallow alluvial deposits upstream of the Lompoc Narrows is referred to as “underflow.” All three GSAs in the SYRVGB consistently treated the flow components of the underflow upstream of the Lompoc Narrows as part of the surface water budget.

Figure 2 also shows the aquifers in the three management areas of the Santa Ynez River Valley: EMA, CMA, and WMA. The aquifers for these management areas are connected to varying degrees. The border between the EMA and CMA areas is where the aquifer narrows significantly, near the city of Solvang. This narrowing is based on surface geological mapping, which indicates predominantly impermeable formations between the EMA and CMA upland areas. The border between the CMA and WMA is based on the topographic divide between Santa Rosa Creek and Santa Rita Valley. Based on observed water levels, little water moves between the upland border between the CMA and WMA. In the WMA, there are two principal aquifers. The Lower Aquifer crosses under the Upper Aquifer in the Lompoc Plain, and the Upper Aquifer is between the Lower Aquifer and the river, as shown on Figure 2. Overall, Figure 2 shows that there is very little subflow connection between the principal aquifers of the EMA, CMA, and WMA.



Note: Schematic diagram, not to scale. Flows from Historical Water Budget (1982-2018)



SANTA YNEZ RIVER GROUNDWATER BASIN SUBSURFACE OUTFLOW SCHEMATIC WATER BUDGET (1982-2018)

However, also shown in Figure 2, the groundwater from all the aquifers connects directly or indirectly with the Santa Ynez River, which flows through all management areas. In the EMA, impermeable rock blocks the aquifer from the river, resulting in no mixing or exchange. However, the principal aquifers in the EMA have an outflow component to the tributaries that flow into the Santa Ynez River. In most of the CMA, the groundwater is also blocked from the river by impermeable formations. However, near the city of Buellton, the groundwater aquifer is connected to the underflow deposits of the Santa Ynez River, which acts as an intermediary buffer between the groundwater aquifer and the surface flow of the Santa Ynez River. There is some exchange between the groundwater aquifer and the river system in this region. In the WMA, upstream of the Lompoc Narrows, groundwater is blocked from the river by impermeable rock, so they do not interface. However, in the WMA below the Lompoc Narrows, the Upper Aquifer groundwater is directly connected to the river.

Figure 2 also shows how groundwater in the WMA connects to the Pacific Ocean. The Upper Aquifer gets thinner and narrower as it gets closer to the ocean, especially near the river's estuary. The Lower Aquifer moves away from the Santa Ynez River and the Upper Aquifer and, instead, continues southwest along the syncline into the Lompoc Terrace. The Lower Aquifer comes close to the Pacific Ocean near Bear Creek on the southern portion of the Vandenberg Space Force Base, but it is not hydraulically connected to the ocean like the Upper Aquifer is along the Santa Ynez River.

Each of the management areas presented figures illustrating aspects of the hydrological cycle to illustrate their water budgets. The EMA presented a generalized figure from DWR (**Figure 3**), while the CMA (**Figure 4**) and WMA (**Figure 5**) developed specific images customized to local conditions.

COLLABORATION ON BASIN HYDROLOGY AND ANALYSIS PERIODS

The three GSAs collaborated on basin hydrology to develop the GSPs. However, the GSAs represent distinct geographical areas with differing conditions that affect the water supply. Each

GSA has different streamflow and precipitation gages that are more representative of conditions that occur within each GSA. Additionally, the three GSAs have differing amounts of historical data availability. As part of developing the water budget, the three GSAs' teams emailed and met to determine what period of record would best represent historical conditions for all three GSAs.

In a series of meetings in late 2019 and early 2020,³ the teams from the three GSAs considered records and cumulative departure from means for four precipitation stations located throughout the Santa Ynez basin and vicinity: Lompoc, Santa Barbara, Cachuma Lake, and Gibraltar Dam. Additionally, most historical groundwater level data and most groundwater production data were collected after the Santa Ynez River Water Conservation District (SYRWCD) began preparing the Engineering and Survey Report on Water Supply Conditions in 1979. As a result of these meetings, the three GSAs identified the period of 1982–2018 as the period to use basin-wide. The period was considered hydrologically balanced, representative of the long-term period of record in the basin, and inclusive of both wet and dry periods.

As part of the 2027 Periodic Evaluation, the GSAs plan to continue using 1982–2018 as the analysis period for historical conditions, with a potential reassessment after 2032. As described in other documents, the six completed water years since 2018 have included three dry or below-normal years and three above-normal or wet years. In 2022, prompted by SGMA, groundwater monitoring in the basin increased because fall monitoring began basin wide.

³ In a collaborative meeting on January 9, 2020, Stetson Engineers (WMA and CMA) and GSI Water Solutions (EMA) after their independent reviews following an earlier meeting, both proposed the period 1983-2018. This later was revised to 1982–2018, which was adopted by all three GSAs.

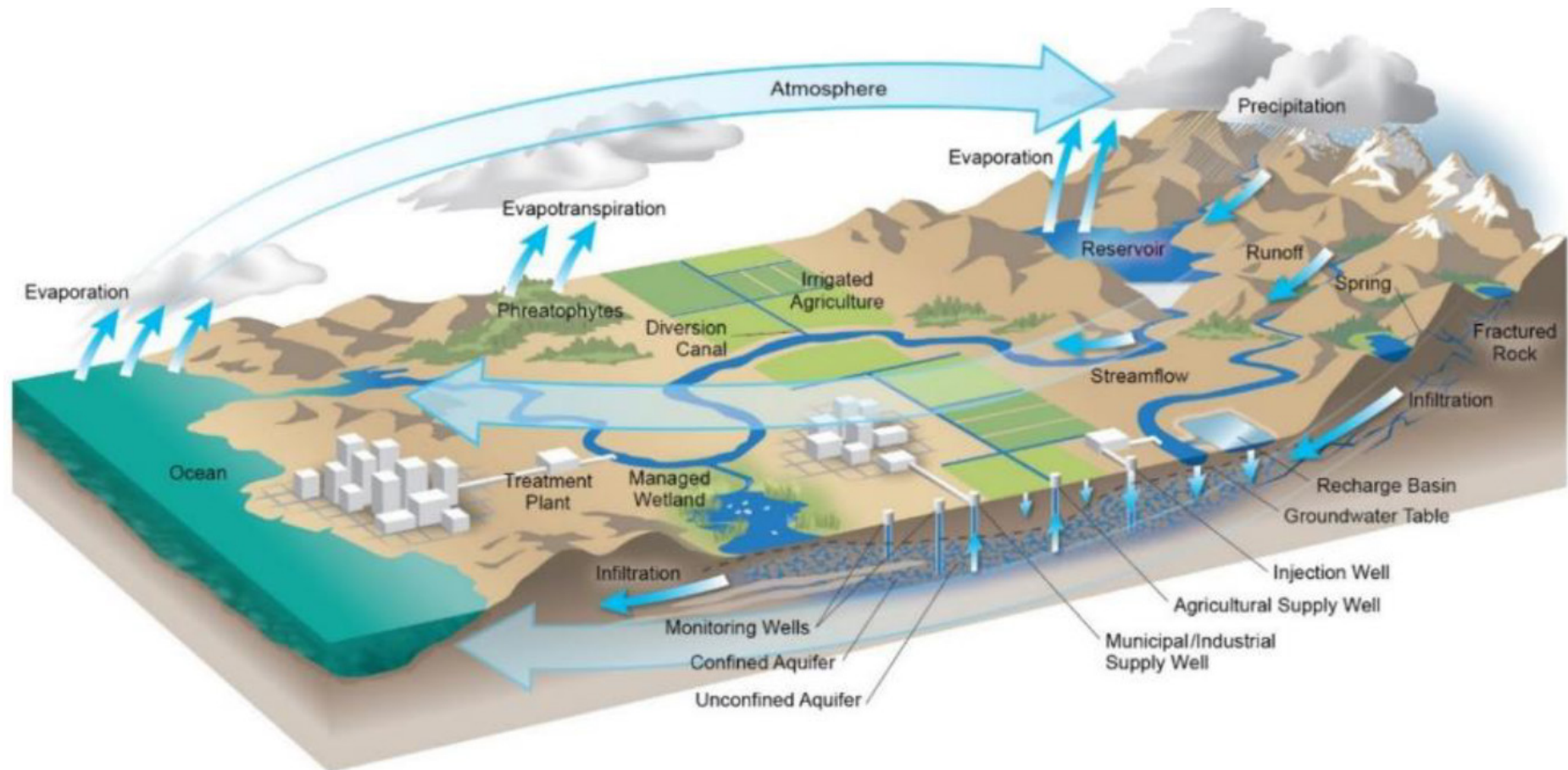
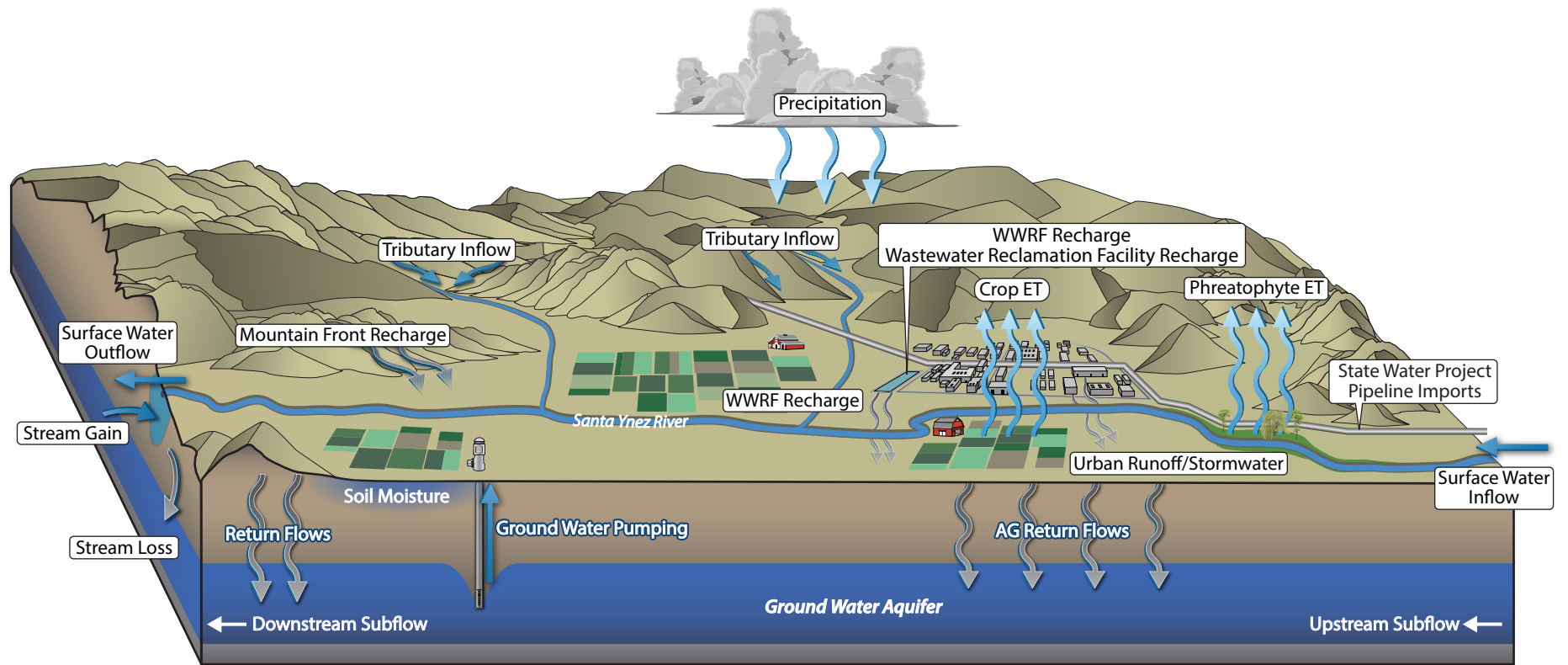
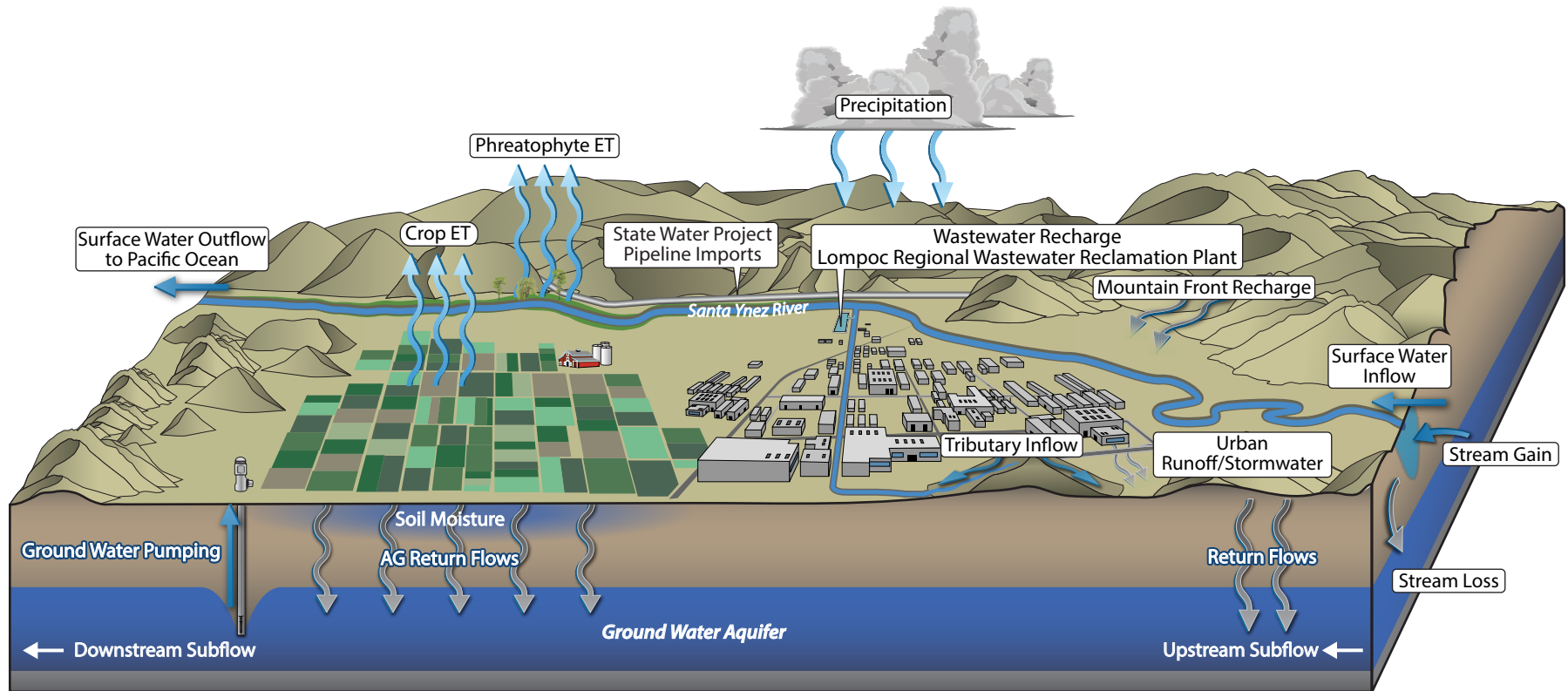


Figure 3-43. Hydrologic Cycle

(Source: DWR, 2016a)





The GSPs analyzed the 1982–2018 Historical Period to understand inflows and outflows within the GSAs. Table 3-27 from the EMA GSP (**Attachment II**), Table 2c.3-6 from the CMA (**Attachment III**) and Table 2c.3-6 from the WMA GSPs (**Attachment IV**) present the water budget summaries for groundwater. Attachment II also includes the surface water budgets for the EMA. Table 3-23 from the EMA GSP (**Attachment V**), Table 2c.3-2 from the CMA (**Attachment VI**) and Table 3-23 from the WMA GSP (**Attachment VII**) provide relevant information about the surface water budget. Table 2c.3-3 from the CMA GSP (**Attachment VIII**) and Table 2c.3-3 from the WMA GSP (**Attachment IX**) are the full surface water budget for the CMA and WMA, respectively.

BASIN-WIDE CONSISTENCY IN WATER BUDGET COMPONENTS

The GSAs coordinated portions of their groundwater and surface water budgets. Generally, three portions of the water budget were coordinated:

1. Groundwater flow between GSAs
2. Santa Ynez River Alluvium underflow (below ground) between GSAs
3. Above-ground Santa Ynez River flow between GSAs

Figure 2 is a conceptual figure that helps with organization across the basin and summarizes the major components across the Basin and how they are evaluated at the borders between the EMA, CMA, and WMA. In this section, the water budget is reviewed, generally going from the east to the west. Note that “AFY” is acre-feet per year and “AF” is acre-feet. The values discussed below are historical averages (1982-2018 period). Earlier, **Error! Reference source not found.**, presented a summary of the numbers discussed below.

EMA INFLOWS

The EMA inflows are not specifically coordinated, as the area is upstream from the CMA and is only connected as discussed in the following section. The EMA border extends east of Lake

Cachuma, and the southern boundary of the EMA encompasses portions of northern Lake Cachuma (see Figure 1). The greatest surface water inflows are the Santa Ynez River Inflow and Tributary Inflow (61,600 AFY and 27,000 AFY in Attachment II). After the SYR flows from Lake Cachuma, the river crosses the southern portion of the EMA boundary at multiple points. Stream gages along this portion of the river allow for quantification of the SYR inflow and outflow. There are also stream gages along tributaries that flow in the EMA. Other inflows include mountain front recharge, precipitation recharge, “ag irrigation return flows”, imported [water], and septic return flows. These flows are either estimated or derived from information from water suppliers or the SYRWCD.

The primary groundwater inflow is precipitation recharge (11,300 AFY in Attachment II). This component is modeled using USGS data. The other groundwater inflows include mountain front recharge, “ag irrigation return flows”, tributary percolation, urban irrigation return flows, septic return flows, and Chumash Wastewater Treatment Plant (“WWTP”) effluent. These flow values are EMA-specific.

FLows WITHIN EMA

In the EMA, the principal aquifers are the Paso Robles Formation and Careaga Sand Formation. The principal aquifers are bound below by bedrock. In particular, bedrock separates the SYR system from the principal aquifers. The subsurface flow (groundwater flow) from the higher-elevation Santa Ynez Upland to the lower-lying SYR is relatively small (negligible) due to impermeable bedrock, but some water from the upland aquifers is transmitted to tributaries that drain into the Santa Ynez River.

The Paso Robles Formation has the greatest lateral extent and contains most of the groundwater in storage. Thus, the Paso Robles Formation contains the most pumping activity. The Careaga Sand is present at the surface near the San Rafael Mountains (northeastern side of the EMA) and the Purisima Hills (western side of the EMA). Generally, the Careaga Sand underlies the Paso Robles Formation.

All three GSAs use SYRWCD pumping data within their water budget to determine groundwater outflows. The EMA estimates groundwater pumping in “White Area” (the area outside of the SYRWCD). Water reported to SYRWCD averages 5,310 AFY while the “White Area” pumping totals 9,220 AFY (see Attachment II).

EMA OUTFLOWS, CMA INFLOWS

The EMA water budget includes three types of outflow from the EMA into the CMA: groundwater transfer within the Paso Robles and Careaga Formations along the EMA-CMA upland border; a surface water transfer via underflow along the EMA-CMA border along the river; and a surface water transfer above ground. The Paso Robles and Careaga Formations span the border of the Buellton Upland and Santa Ynez Upland subareas, resulting in some subsurface flow (groundwater flow) between the EMA and CMA. This value is referred to as “subsurface outflow” in the EMA groundwater outflow portion of the water budget (Attachment II) and as “subflow in” in the groundwater inflow portion of the water budget (Attachment III). Subsurface flow occurs around some tributaries that traverse the EMA-CMA boundary. The flow is relatively small, resulting in approximately 85 acre-feet per year (“AFY”). This outflow is reported in the EMA GSP as 100 AFY because of rounding, as shown in Attachment II. This flow is presented as 85 AFY in the CMA’s water budget but is rounded to 90 AFY for the historical average, shown in Attachment III. These values, despite rounding, are congruent with each other.

Another transfer between EMA and CMA is through the SYR underflow. The underflow is considered surface water because the GSPs describe the SYR underflow as occurring in a known and definite channel, even though the water is below the ground surface. The SYR underflow is reported as “subsurface outflow” in the EMA surface water outflow portion of the water budget (Attachment V) as 1,800 AFY. This underflow from the EMA to the CMA within the SYR alluvium is not directly reported in the CMA. The value for the CMA is presented indirectly. The 1,800 AFY can be checked in the CMA by subtracting the subflow from the Buellton aquifer (690 AFY from Attachment III) from the total subsurface inflow (2,490 AFY from Attachment VI). The table of annual surface water inflow (Attachment VI) notes that the 2,490 AFY includes the SYR underflow and the subflow from the Buellton aquifer.

Lastly, the above-ground surface water outflow from the EMA is consistent with the CMA inflow, 85,700 AFY. This value is in the surface water outflow portion of the EMA (Attachment II), rounded to the nearest hundred and labeled “surface outflow”. This value is in the surface water inflow portion of the CMA (Attachment VI), rounded to the nearest ten and labeled “Santa Ynez River Inflow from EMA”.

FLOWS WITHIN CMA

In the CMA, the Buellton aquifer is the principal aquifer. The Buellton aquifer is largely disconnected from the SYR. The CMA GSP notes that subsurface outflow from the Buellton aquifer occurs along the southern boundary with the SYR Alluvium (generally, above the Buellton Bend). The subflow from the principal aquifer to the Alluvium was estimated at 690 AFY (see Attachment III).

CMA OUTFLOWS, WMA INFLOWS

There may be an aquitard or other structural impediment along the Santa Rita Upland-Buellton Upland border, based on groundwater levels and geology. USGS reports indicate no substantial flow in the area⁴. Preliminary groundwater modeling calibrates to observed water levels, assuming a fault that acts as a barrier. Thus, no subsurface outflow in this region is considered.

At the border between the WMA and CMA, SYR underflow is transferred between the two GSAs. The CMA notes this as “Santa Ynez River Underflow out”, averaging 800 AFY, shown in Attachment VI. The WMA includes this transfer as “Subsurface inflow” in Attachment VII. These values match. This value is part of the Surface Water Outflow/Inflow in the **Table 8** and **Table 9**.

Lastly, the CMA surface water outflow (91,320 AF [Attachment VI]) is the same as the WMA surface water inflow (Attachment VII).

⁴ Hamlin 1985

FLOWS WITHIN THE WMA

The flows within the WMA are not specifically coordinated, as the area is downstream from the CMA and is only connected as discussed in the previous section. The condition of the Upper Aquifer is more closely related to Santa Ynez River flow. For example, in wet years, the Upper Aquifer is expected to have greater recharge when the surface flows are higher.

The Upper Aquifer overlies the Lower Aquifer in the Lompoc Plain subarea. Within this overlap, water moves primarily from the Lower Aquifer, which originates in the upland area, to the Upper Aquifer. At the Lompoc Narrows, the designation of the known and definite channel ends, as the alluvium spreads from a narrow canyon constrained by shale deposits to a wide plain with deeper alluvial deposits underlain by the Lower Aquifer. The underflow at the Lompoc Narrows into the WMA is noted in the GSP as an average annual flow of 1,200 AF (see Attachment VII). This is the amount of water transferred from the SYR underflow to the Upper Aquifer in the Lompoc Plain. This value is not coordinated because it represents a flow entirely within the WMA.

For the portion of the Lower Aquifer not overlain by the Upper Aquifer, the Lower Aquifer is the primary water-bearing unit, particularly in the Lompoc Upland and Santa Rita Upland areas. The movement of groundwater in the Lower Aquifer within the Santa Rita subarea was identified as a data gap in the GSP. The design and construction of a new well in this subarea is planned to be completed in 2026.

WMA OUTFLOWS (TO PACIFIC OCEAN)

Outflows from the WMA are not specifically coordinated as the area is downstream from the CMA. As the WMA's western edge borders the Pacific Ocean, the water budget accounts for outflows to the Pacific Ocean. The WMA also monitors potential seawater intrusion from the Pacific Ocean. The area of Santa Ynez River estuary is a where the Upper Aquifer is underlain by non-water-bearing units (Sisquoc or Monterey Formations). The water-bearing Lower Aquifer does extend this far west, so the Upper Aquifer is not underlain by the Lower Aquifer here. The WMA groundwater budget includes a minor "subflow out" of 100 AFY (see Attachment IV). The

WMA GSP describes this outflow occurring in a narrow channel, constricted by bedrock to the north and south.

The SYR flows to the Pacific Ocean through the SYR estuary. SYR outflow to the Pacific Ocean is the largest component, 89,190 AFY (see Attachment VII). The WMA is working to install a stream gage near the SYR estuary to better estimate this outflow and to get accurate measurements of streamflow gains and losses as the river travels through the Upper Aquifer, which is currently a data gap identified in the 2022 GSP.

CURRENT AND PROJECTED GROUNDWATER DEFICITS

The RCA requests that the three GSAs collaboratively show how the “GSA projects and management actions will improve the current and projected groundwater deficits.” In WY 2024 and WY2025 the three GSAs collaborated on joint annual reports that combined the information from all three management areas. On an annual basis, and on a long-term basis, the GSAs determined that there is currently no basin-wide groundwater deficit. See **Table 4**.

Table 4
WY 2024 Change in Groundwater Storage, by GSA, in Acre-Feet

GSA	WMA (AF)		CMA (AF)	EMA (AF)		Basin-Wide (Total AF)
Principal Aquifer	Upper Aquifer	Lower Aquifer	Buellton Aquifer	Paso Robles Formation	Careaga Sand	
WY 2024 Change	800	-200	1,000	6,700	-600	7,700
Total Change Since 2015	14,000	3,100	5,900	-14,100	-1,100	7,800

Notes:

“AF” is acre-feet.

Numbers are rounded to the nearest 100 AF.

Source: Joint Table 5-1 from Santa Ynez River Valley Groundwater Basin. SGMA Joint Annual Report, Water Year 2024

The historical budgets presented in the 2022 GSPs did identify some areas of concern, like the water budgets in the EMA and subareas of the WMA and CMA like the Santa Rita Creek subarea. The GSPs described projects and management actions that address these imbalances in the water budget. All three GSAs have adaptive strategies with tiered adoption for their projects and management actions. This means they have a substantial number of projects and management actions planned in the event of potential deficit conditions. Each individual project will have

different levels of impact. **Table 5** summarizes the projects and management actions currently considered. Apart from the Lower Santa Ynez (LSYR) Action Plan, all the projects would be implemented independently by each GSA - similar projects in multiple GSAs are counted individually.

Table 5
Count of Current and Planned SGMA Projects and Management Actions as of 2026

GSA	Other Projects and Actions		PMAs			
	Implementation Projects	LSYR Action Plan	Group 1	Group 2	Group 3	Group 4
WMA	8	4	5	2	1	7
CMA	7	4	4	2	1	6
EMA	7	4	4	3	8	--
Total	22	4	13	7	10	13

Note: The WMA and CMA GSPs distinguished between projects or actions which were expected to directly result in improvement with one or more of the underlying sustainability indicators, and those needed to comply with administration or measurements of the indicators.

RCA #3 asks for additional analysis to address conditions of shortage, which are not currently present. As there are a substantial number of project and management actions, proceeding with additional assessment is outside of addressing the RCA. Please refer to the status of project and management actions in the periodic evaluations and ongoing annual reports.

DATA GAPS

RCA #3 part a.), requests that the GSAs “collaboratively and consistently [...] **assess associated data gaps effecting the water budget (like groundwater level information).**” The data gaps are not making the water budget occur; however, they do in part influence the accuracy of the results. The data gaps affecting the water budget are discussed in the WMA and CMA Periodic Evaluations Section 2, Section 4, Section 5, and Section 6. For groundwater level information, for example, more water level observation wells are planned to be added to the monitoring database to improve the assessment of water levels and storage change in the CMA and the Santa Rita subarea of the WMA. The other primary data gap in the water budget is the surface water outflows from both the CMA and WMA, which is being addressed by the establishment of new streamflow

gages near the downstream boundary. Also, the gaps related to the survey information and fall water level data are not fully addressed. These data gaps do not currently affect the water budget.

INFLOW AND OUTFLOW TABLES

Table 6, Table 7, Table 8, and Table 9 provide the groundwater and surface water inflows and outflows as detailed in the original GSPs. These tables provide detailed, annual information about each year from 1982 through 2018, and the average over this period. As described above the three GSAs coordinated in selecting this period as was hydrologically balanced relative to the long-term period of record.

Table 10 and Table 11 synthesizes the basin surface and ground water annual average volumes using the basin as the control volume. These tables provide a consolidated version of the basin's water budget. Due to the hydrogeologic conditions of the basin, it is more useful to consider particular flows that cross GSA boundaries than to focus on the difference between groundwater or surface water inflows and outflows within each management area.

CONCLUSION

The above discussion illustrates that the water budget is consistent across the SYRWCD in terms of time periods, conceptual understanding, and boundary conditions. The GSAs recognize that edits could be made to ensure that all reporting, tables, and figures use common language to clarify the subflow and underflow. However, these clarifications are clarifications and not changes – and the GSAs evaluate this as not warranting a plan amendment. The GSAs will continue to coordinate inflow and outflow values in their water budget and management efforts.

Table 6

Joint Presentation of Groundwater Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)																			
EMA																			
	Groundwater Inflow							Groundwater Outflow											
								City of Solvang Pumping	ID No. 1 and SYRWCD Self-Reported Pumping			“White Area” Pumping			Total Pumping	Outflow to Tributaries	Phreatophyte ET (GW)	Evaporative Losses	Subsurface Outflow (GW)
Water Year	Mountain Front Recharge (GW)	Tributary Percolation	Precipitation Recharge (GW)	Chumash WWTP Effluent	Septic Return Flows (GW)	Ag Irrigation Return Flows (GW)	Urban Irrigation Return Flows		Agricultural Water Pumping	Other Water Pumping	Special Irrigation Water Pumping	Ag Irrigation Pumping	Mutual Water Companies	Rural Domestic Pumping					
1982	3,300	600	6,600	0	700	3,000	60	90	4,300	1,000	0	7,200	650	200	13,440	900	3,000	0	100
1983	7,000	700	41,900	0	700	2,800	60	90	4,400	1,100	0	7,200	670	200	13,660	17,500	3,100	0	100
1984	1,900	1,600	7,200	0	700	3,400	50	90	4,100	1,000	0	7,200	690	200	13,280	400	3,100	0	100
1985	700	300	1,400	0	800	3,200	20	100	4,800	1,200	0	7,200	710	200	14,210	0	3,100	0	100
1986	4,900	500	10,500	0	800	3,200	30	110	4,700	1,100	0	7,700	730	200	14,540	1,700	3,100	0	100
1987	700	800	2,500	0	800	3,300	40	100	4,000	700	0	7,800	740	200	13,540	0	3,100	0	100
1988	3,800	400	9,800	0	800	3,200	30	30	4,600	1,100	0	7,800	740	200	14,470	1,300	3,100	0	100
1989	400	800	1,200	0	900	2,900	50	20	4,100	2,900	0	7,800	750	200	15,770	0	3,100	0	100
1990	100	300	100	0	900	2,700	40	20	4,100	3,900	0	7,700	760	200	16,680	0	3,100	0	100
1991	3,100	300	5,500	0	900	3,000	30	150	4,800	1,200	0	7,600	770	200	14,720	700	3,000	0	100
1992	6,200	800	14,800	0	900	2,800	40	130	5,000	1,300	0	7,600	780	200	15,010	3,700	3,100	0	100
1993	7,200	1,100	27,200	0	900	2,700	10	470	4,200	2,100	0	7,400	780	200	15,150	8,300	3,100	0	100
1994	1,700	1,200	6,000	0	900	2,400	10	350	3,300	1,800	0	7,300	790	300	13,840	200	3,100	0	100
1995	4,500	600	26,700	0	900	2,300	10	490	3,900	2,400	0	7,200	800	300	15,090	6,000	3,000	0	100
1996	1,900	1,300	6,800	0	900	2,500	10	310	4,500	3,000	0	7,100	810	200	16,020	400	3,100	0	100
1997	5,600	500	11,200	0	900	2,400	10	480	3,600	2,300	0	7,700	810	200	15,190	2,100	3,100	0	100
1998	5,900	500	33,500	0	900	2,500	30	500	3,000	1,800	60	8,300	820	300	14,780	10,900	3,000	0	100
1999	2,200	1,600	8,700	0	900	2,800	120	480	3,300	1,900	20	9,000	830	300	15,830	600	3,000	0	100
2000	4,200	500	14,100	0	1,000	3,000	260	560	3,400	1,800	10	9,700	830	300	16,600	2,500	3,100	0	100
2001	6,300	700	25,800	0	1,000	2,900	240	740	3,100	1,400	10	9,200	840	300	15,590	5,800	3,100	0	100
2002	200	1,100	1,400	0	1,000	2,600	250	370	2,900	1,100	20	8,700	840	300	14,230	0	3,100	0	100
2003	4,600	300	12,700	120	1,000	2,700	260	200	2,900	1,200	10	8,700	850	300	14,160	2,200	3,100	0	100
2004	1,800	700	6,200	120	1,000	2,500	240	180	2,800	1,300	20	8,800	860	300	14,260	300	3,100	0	100
2005	6,900	500	34,900	120	1,000	2,400	240	140	2,300	1,200	20	8,800	860	300	13,620	13,400	3,000	0	100

Joint Presentation of Groundwater Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)																			
EMA																			
	Groundwater Inflow							Groundwater Outflow											
								City of Solvang Pumping	ID No. 1 and SYRWCD Self-Reported Pumping			“White Area” Pumping			Total Pumping	Outflow to Tributaries	Phreatophyte ET (GW)	Evaporative Losses	Subsurface Outflow (GW)
Water Year	Mountain Front Recharge (GW)	Tributary Percolation	Precipitation Recharge (GW)	Chumash WWTP Effluent	Septic Return Flows (GW)	Ag Irrigation Return Flows (GW)	Urban Irrigation Return Flows		Agricultural Water Pumping	Other Water Pumping	Special Irrigation Water Pumping	Ag Irrigation Pumping	Mutual Water Companies	Rural Domestic Pumping					
2006	5,200	1,600	15,900	120	1,000	2,400	180	100	2,500	1,400	20	8,700	870	300	13,890	3,200	3,100	0	100
2007	0	800	800	120	1,000	2,400	200	140	3,100	1,800	20	8,500	880	300	14,740	0	3,100	0	100
2008	5,600	300	13,600	120	1,000	2,400	240	190	3,300	2,100	30	8,300	880	300	15,100	2,900	3,100	0	100
2009	1,200	700	3,400	120	1,000	2,300	260	160	2,900	1,800	20	8,300	890	300	14,370	100	3,100	0	100
2010	4,300	600	12,800	120	1,000	2,100	240	140	2,700	1,300	20	8,200	890	300	13,550	2,000	3,000	0	100
2011	7,000	900	30,000	110	1,000	2,100	170	0	2,800	1,500	20	8,100	900	300	13,620	10,000	3,000	0	100
2012	800	1,200	2,700	40	1,000	2,300	190	110	3,200	2,200	30	8,000	910	300	14,750	0	3,100	0	100
2013	400	500	700	40	1,000	2,400	210	180	3,600	2,400	20	8,100	910	300	15,410	0	3,100	0	100
2014	0	300	100	40	1,100	2,300	220	290	3,400	2,200	20	8,100	920	300	15,230	0	3,200	0	100
2015	100	400	100	40	1,100	2,600	170	230	3,300	1,800	10	8,600	930	300	15,170	0	3,200	0	100
2016	300	400	200	40	1,000	2,300	160	290	3,200	1,600	10	9,000	930	300	15,330	0	3,100	0	100
2017	5,900	400	14,200	40	1,000	2,500	170	190	3,000	1,700	10	9,000	940	300	15,140	3,000	3,100	0	100
2018	500	900	8,200	40	1,100	2,300	200	370	2,900	1,700	10	9,000	950	300	15,230	0	3,100	0	100
Historical 1982–2018 Average	3,100	700	11,300	40	900	2,630	150	230	3,600	1,700	10	8,100	820	300	14,700	2,700	3,081	0	100

Table 7

Joint Presentation of Groundwater Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)																							
	CMA											WMA											
	Groundwater Inflows						Groundwater Outflows					Groundwater Inflows							Groundwater Outflows				
Water Year	Subflow In	Precipitation Recharge-Overlying	Mountain Front Recharge	Net Stream Percolation	Agricultural Return Flows	Urban Return Flows	Agricultural Pumping	Municipal Pumping	Domestic Pumping	Phreato-phytes	Subflow Out	Subflow In	Precipitation Recharge-Overlying	Mountain Front Recharge	Net Stream Percolation	Agricultural Return Flows	Urban Return Flows	Agricultural Pumping	Municipal Pumping	Domestic Pumping	Phreato-phytes	Subflow Out	
1982	85	1,873	768	161	466	23	2,364	221	53	88	700	1,200	6,583	2,086	9,517	3,387	623	17,031	6,443	203	4,914	100	
1983	85	3,557	768	1,137	442	19	2,240	266	44	88	700	1,200	10,570	4,919	28,131	2,967	613	14,924	6,110	218	4,914	100	
1984	85	2,088	768	262	510	21	2,582	405	48	88	683	1,200	8,496	2,450	17,657	3,223	845	16,209	6,990	235	4,914	100	
1985	85	1,998	768	139	527	19	2,659	335	43	88	673	1,200	7,756	2,288	8,070	3,276	830	16,463	7,503	260	4,914	100	
1986	85	2,115	768	451	457	23	2,308	426	53	88	609	1,200	8,941	2,380	19,973	3,413	922	17,134	8,510	279	4,914	100	
1987	85	1,463	768	124	482	26	2,438	487	60	88	504	1,200	6,359	2,907	9,665	4,292	907	21,548	8,126	259	4,914	100	
1988	85	1,779	768	114	464	28	2,347	326	63	88	610	1,200	8,799	3,657	8,249	3,912	1,019	19,647	8,732	242	3,718	100	
1989	85	1,267	768	34	512	32	2,590	205	72	88	526	1,200	5,194	3,091	4,224	3,912	1,063	19,656	9,219	213	3,464	100	
1990	85	1,044	768	12	531	40	2,683	288	91	88	483	1,200	5,669	2,875	3,888	4,104	1,018	20,617	7,945	222	3,464	100	
1991	85	1,634	768	227	465	44	2,357	90	100	88	504	1,200	8,113	2,906	14,458	3,977	897	19,976	7,173	224	4,533	100	
1992	85	2,321	768	446	367	45	1,859	315	103	88	483	1,200	7,526	2,367	22,267	4,058	910	20,362	7,365	211	4,914	100	
1993	85	2,654	768	757	280	39	1,427	223	89	88	526	1,200	8,965	3,172	22,844	3,984	903	20,029	7,890	226	4,914	100	
1994	85	1,584	768	203	255	37	1,302	436	84	88	801	1,200	7,056	1,908	16,084	3,511	937	17,680	8,144	214	4,914	100	
1995	85	2,834	768	1,470	208	39	1,068	385	88	88	780	1,200	11,637	4,828	26,319	3,020	853	15,213	7,656	220	4,914	100	
1996	85	1,668	768	292	242	38	1,241	301	86	88	695	1,200	6,769	1,976	15,071	3,803	955	19,154	8,181	216	4,914	100	
1997	85	1,677	768	424	250	39	1,280	374	88	88	1,056	1,200	6,326	2,028	16,567	5,005	1,094	25,165	8,114	224	4,914	100	
1998	85	3,216	768	1,361	241	39	1,226	115	89	88	907	1,200	14,080	4,392	27,616	3,640	888	18,297	7,230	186	4,914	100	
1999	85	2,171	768	408	342	72	1,739	138	165	88	886	1,200	7,874	2,774	14,226	4,192	984	21,084	7,631	211	4,914	100	
2000	85	2,124	768	488	396	71	2,014	173	192	88	865	1,200	8,643	2,707	15,155	4,430	1,055	22,303	7,952	214	4,914	100	
2001	85	2,676	768	771	429	91	2,232	362	206	88	928	1,200	10,054	2,888	18,714	4,314	1,068	21,767	7,392	224	4,914	100	
2002	85	1,568	768	164	388	101	2,104	318	230	88	780	1,200	7,286	1,730	13,469	4,420	1,143	22,399	7,953	234	4,914	100	
2003	85	1,757	768	270	291	107	1,676	325	243	88	844	1,200	7,231	1,787	17,652	3,509	1,122	17,906	7,841	223	4,914	100	
2004	85	1,540	768	121	365	114	2,130	226	260	88	971	1,200	6,901	1,738	10,662	3,700	1,198	18,969	8,099	224	4,914	100	
2005	85	3,394	768	1,046	334	109	1,960	89	248	88	1,119	1,200	11,851	4,367	20,239	3,550	1,096	18,162	7,351	238	4,914	100	
2006	85	2,069	768	364	259	116	1,717	79	264	88	1,056	1,200	9,141	2,462	16,452	3,212	1,130	16,643	7,642	245	4,914	100	
2007	85	1,281	768	65	321	129	2,133	442	294	88	907	1,200	4,831	1,319	10,735	3,573	1,258	18,596	8,225	280	4,914	100	
2008	85	2,119	768	451	444	154	2,729	663	351	88	632	1,200	8,364	2,285	12,246	3,566	1,250	18,537	8,215	297	4,914	100	

Joint Presentation of Groundwater Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)																							
	CMA											WMA											
	Groundwater Inflows						Groundwater Outflows					Groundwater Inflows							Groundwater Outflows				
Water Year	Subflow In	Precipitation Recharge-Overlying	Mountain Front Recharge	Net Stream Percolation	Agricultural Return Flows	Urban Return Flows	Agricultural Pumping	Municipal Pumping	Domestic Pumping	Phreato-phytes	Subflow Out	Subflow In	Precipitation Recharge-Overlying	Mountain Front Recharge	Net Stream Percolation	Agricultural Return Flows	Urban Return Flows	Agricultural Pumping	Municipal Pumping	Domestic Pumping	Phreato-phytes	Subflow Out	
2009	85	1,417	768	71	483	139	2,988	788	317	88	695	1,200	7,971	1,567	7,032	3,785	1,183	19,712	7,402	326	4,914	100	
2010	85	2,056	768	259	403	118	2,617	718	268	88	444	1,200	9,131	2,687	18,670	3,837	1,052	19,989	6,892	309	4,914	100	
2011	85	2,075	768	629	310	120	2,194	667	272	88	399	1,200	9,521	3,508	21,914	3,460	1,154	18,139	6,879	309	4,914	100	
2012	85	1,585	768	118	338	113	2,573	331	258	88	526	1,200	8,753	2,306	8,407	4,145	1,097	21,862	6,901	281	4,914	100	
2013	85	1,236	768	35	397	112	2,925	546	255	88	165	1,200	6,978	2,684	7,542	4,753	1,100	24,959	7,296	282	3,464	100	
2014	85	1,077	768	23	467	123	3,173	527	279	88	314	1,200	6,481	2,930	8,228	4,052	1,021	21,297	7,153	297	3,464	100	
2015	85	968	768	10	437	123	3,244	786	278	88	504	1,200	5,246	2,752	3,495	4,090	853	21,761	6,083	281	3,464	100	
2016	85	997	768	16	365	110	2,868	625	249	88	526	1,200	6,466	2,924	5,776	3,904	859	20,934	6,138	244	3,464	100	
2017	85	1,552	768	410	365	100	2,856	296	255	88	886	1,200	8,215	2,501	19,911	3,812	835	20,419	5,945	239	4,744	100	
2018	85	890	768	22	276	109	2,415	350	249	88	844	1,200	5,914	2,708	7,967	3,622	895	19,451	6,374	254	4,914	100	
Historical 1982–2018 Average	90	1,870	770	360	380	80	2,220	370	170	90	690	1,200	7,990	2,730	14,300	3,820	990	19,570	7,480	240	4,630	100	

Note: Yellow fill indicates the value coordinated between GSAs.

Table 8

Joint Presentation of Surface Water Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)																						
Water Year	EMA													CMA								
	Surface Water Inflows							Surface Water Outflows						Surface Water Inflows					Surface Water Outflows			
	Santa Ynez River Inflow	Tributary Inflow	Mountain Front Recharge (River)	Precipitation Recharge	Ag Irrigation Return Flows	Imported	Septic Return Flows	Subsurface Outflow	Surface Outflow	Pumping Extractions			Phreatophyte ET	Santa Ynez River (Inflow)	Tributary	Imported SWP	River Alluvium Total Inflows	Total Inflows	Santa Ynez River (Outflow)	Net Percolation to Groundwater	River Alluvium Total Outflows	Total Outflows
										City of Solvang Pumping Extractions	ID No. 1 Pumping Extractions	SYRWCD Pumping Extractions										
1982	4,000	11,100	4,000	100	90	3,000	10	1,800	3,900	1,100	300	2,700	4,100	3,916	1,403	0	5,125	10,445	3,402	161	9,239	12,801
1983	366,200	147,800	8,700	800	70	1,500	10	1,800	511,200	1,200	400	2,400	4,100	511,215	35,305	0	5,721	552,242	539,648	1,137	8,890	549,675
1984	20,100	3,800	3,900	100	110	5,100	10	1,800	24,900	1,200	1,000	2,700	4,200	24,859	2,955	0	5,236	33,049	26,082	262	9,126	35,470
1985	5,400	2,100	400	0	90	2,700	10	1,800	2,700	1,300	700	2,900	4,100	2,677	937	0	5,129	8,742	562	139	8,656	9,358
1986	8,100	21,200	5,700	200	90	2,700	10	1,800	12,300	1,300	500	3,000	4,100	12,297	10,412	0	5,034	27,742	14,906	451	8,144	23,501
1987	4,200	1,700	500	0	100	3,800	10	1,800	1,900	1,300	700	3,300	4,100	1,853	1,374	0	4,735	7,961	1,392	124	8,228	9,743
1988	4,900	9,700	3,500	200	90	2,800	10	1,800	4,100	1,400	700	3,100	4,100	4,119	720	0	4,995	9,834	1,320	114	8,209	9,643
1989	6,700	1,300	500	0	80	2,800	10	1,800	1,800	1,300	600	3,500	4,100	1,758	155	0	4,765	6,677	109	34	8,568	8,712
1990	4,800	1,000	0	0	70	800	10	1,800	600	1,400	700	3,300	4,200	629	84	0	4,702	5,416	39	12	8,771	8,821
1991	5,600	21,000	3,200	100	90	1,700	10	1,800	12,400	1,100	1,600	2,900	4,100	12,361	5,477	0	4,816	22,654	11,091	227	8,429	19,747
1992	14,800	42,200	6,700	300	80	900	10	1,800	40,100	1,200	1,200	3,000	4,200	40,134	8,366	0	5,085	53,585	43,968	446	8,039	52,453
1993	284,000	74,400	8,800	500	70	2,000	10	1,800	364,100	400	1,400	2,000	4,200	364,086	18,499	0	5,258	387,844	377,397	757	7,857	386,011
1994	9,600	5,200	2,500	100	60	1,800	10	1,800	9,400	600	2,000	1,800	4,200	9,390	2,468	0	5,193	17,050	10,416	203	7,806	18,425
1995	360,200	117,200	9,500	500	50	100	10	1,800	533,900	500	800	2,100	4,100	533,933	61,822	0	5,641	601,396	590,940	1,470	7,670	600,081
1996	11,800	5,700	3,500	500	100	2,100	10	1,800	15,900	1,000	1,100	2,100	4,200	15,892	3,624	0	5,206	24,722	17,646	292	7,900	25,838
1997	15,700	13,000	5,800	200	60	2,000	10	1,800	15,300	1,000	100	2,400	4,200	15,294	6,532	74	5,584	27,484	19,711	424	8,042	28,176
1998	397,600	144,000	10,200	700	50	3,500	10	1,800	655,500	900	0	2,300	4,100	655,470	49,154	609	5,905	711,137	699,276	1,361	7,199	707,836
1999	3,100	7,100	3,300	200	70	4,000	10	1,800	11,000	900	1,500	3,000	4,000	10,953	5,491	569	5,522	22,535	14,156	408	7,914	22,478
2000	12,900	16,500	7,800	300	70	3,200	10	1,800	24,200	700	2,000	4,200	4,200	24,183	9,991	602	5,579	40,356	32,004	488	8,170	40,662
2001	117,900	59,900	8,400	500	70	2,700	10	1,800	157,900	300	3,100	4,100	4,100	157,890	22,082	384	5,825	186,181	176,979	771	7,867	185,617
2002	13,700	1,700	100	0	60	2,600	10	1,800	8,500	300	900	4,000	4,100	8,544	1,222	584	5,234	15,584	7,722	164	7,841	15,727
2003	4,700	14,100	6,900	300	50	5,000	20	1,800	7,700	200	2,700	3,700	4,100	7,711	3,344	530	5,409	16,994	9,747	270	7,970	17,987
2004	16,300	5,100	3,000	100	60	3,600	20	1,800	10,100	300	1,000	3,700	4,200	10,147	1,484	511	5,521	17,663	6,017	121	8,674	14,812
2005	266,500	108,900	9,600	700	50	4,600	20	1,800	373,600	100	1,000	3,200	4,100	373,556	33,659	511	5,984	413,710	404,441	1,046	8,583	414,069
2006	71,200	20,600	7,900	300	60	4,600	20	1,800	96,500	100	1,500	3,000	4,200	96,498	5,477	641	5,528	108,144	98,411	364	8,332	107,108
2007	14,300	1,000	0	0	60	4,300	20	1,800	10,900	200	1,500	3,100	4,100	10,885	469	665	5,173	17,192	7,714	65	8,632	16,411
2008	33,300	20,800	6,600	300	60	4,200	20	1,800	49,600	200	1,700	3,300	4,100	49,596	10,337	513	5,238	65,684	57,782	451	8,497	66,730

Joint Presentation of Surface Water Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)																						
Water Year	EMA													CMA								
	Surface Water Inflows							Surface Water Outflows						Surface Water Inflows					Surface Water Outflows			
	Santa Ynez River Inflow	Tributary Inflow	Mountain Front Recharge (River)	Precipitation Recharge	Ag Irrigation Return Flows	Imported	Septic Return Flows	Subsurface Outflow	Surface Outflow	Pumping Extractions			Phreatophyte ET	Santa Ynez River (Inflow)	Tributary	Imported SWP	River Alluvium Total Inflows	Total Inflows	Santa Ynez River (Outflow)	Net Percolation to Groundwater	River Alluvium Total Outflows	Total Outflows
										City of Solvang Pumping Extractions	ID No. 1 Pumping Extractions	SYRWCD Pumping Extractions										
2009	8,700	4,300	900	100	50	3,100	20	1,800	4,800	200	1,600	3,600	4,200	4,753	481	293	4,908	10,435	2,362	71	8,345	10,779
2010	14,400	19,400	6,200	100	40	4,200	20	1,800	18,600	300	400	3,300	4,100	18,594	4,572	226	5,091	28,483	18,906	259	8,246	27,411
2011	93,700	54,100	8,900	600	40	5,000	20	1,800	120,400	100	500	2,600	4,100	120,436	15,004	394	5,008	140,841	130,640	629	7,994	139,264
2012	6,900	4,200	700	100	60	4,400	20	1,800	4,900	100	1,100	3,900	4,200	4,862	763	582	5,003	11,210	3,107	118	8,734	11,959
2013	16,600	1,600	600	0	60	3,500	20	1,800	11,500	200	1,400	3,900	4,200	11,520	250	216	4,591	16,577	6,378	35	8,923	15,335
2014	10,200	1,200	0	0	60	2,100	20	1,800	6,100	200	1,700	4,000	4,200	6,118	165	32	4,632	10,947	4,433	23	8,974	13,429
2015	14,800	1,800	100	0	70	2,100	20	1,800	9,500	300	2,200	4,100	4,300	9,518	73	0	4,633	14,224	3,370	10	8,719	12,099
2016	13,500	2,500	400	0	50	400	20	1,800	8,000	400	600	3,800	4,200	8,006	116	82	4,638	12,842	3,823	16	8,649	12,488
2017	10,100	28,300	5,700	300	200	3,000	20	1,800	18,700	300	1,400	4,500	4,200	18,652	10,820	293	5,255	35,020	24,538	410	9,026	33,974
2018	14,200	2,700	600	200	50	1,800	20	1,800	9,300	300	1,200	3,300	4,200	9,315	162	224	5,035	14,735	8,527	22	9,239	17,788
Historical 1982–2018 Average	61,600	27,000	4,200	200	70	2,900	10	1,800	85,700	600	1,200	3,200	4,100	85,720	9,060	230	5,190	100,200	91,320	360	8,380	100,070

Notes:
Yellow fill indicates the value coordinated between GSAs.
Orange indicates a portion of the value is coordinated. Particularly, the River Alluvium Total Inflows for the CMA includes the Subsurface Outflow of the EMA. Described in further detail later in the EMA Outflows, CMA Inflows Section of this document.
“SWP” is State Water Project.
“ID No. 1” Santa Ynez River Water Conservation District, Improvement District No. 1

Table 9

Joint Presentation of Surface Water Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)										
WMA										
Water Year	Surface Water Inflows						Surface Water Outflows			
	Santa Ynez River (Inflow)	Tributary	Lompoc Wastewater	Imported SWP	River Alluvium Total Inflows	Total Inflows	Santa Ynez River (Outflow)	Net Percolation to Groundwater	River Alluvium Total Outflows	Total Outflows
1982	3,402	2,902	3,583	0	3,289	13,175	1,592	9,517	7,433	18,542
1983	539,648	64,565	3,786	0	4,112	612,111	499,844	28,131	7,286	535,262
1984	26,082	6,168	3,666	0	3,363	39,279	22,370	17,657	7,267	47,295
1985	562	2,297	3,968	0	3,260	10,087	0	8,070	6,957	15,028
1986	14,906	19,078	4,090	0	3,275	41,350	20,688	19,973	6,723	47,384
1987	1,392	2,896	4,107	0	2,960	11,355	654	9,665	6,800	17,120
1988	1,320	1,688	3,944	0	3,122	10,073	0	8,249	6,813	15,062
1989	109	400	4,019	0	3,014	7,542	0	4,224	7,579	11,804
1990	39	317	3,707	0	3,070	7,134	0	3,888	8,415	12,303
1991	11,091	9,445	3,616	0	3,293	27,446	13,782	14,458	8,022	36,263
1992	43,968	12,689	3,691	0	3,602	63,950	47,843	22,267	7,814	77,923
1993	377,397	30,539	3,889	0	3,748	415,572	382,370	22,844	7,698	412,911
1994	10,416	5,068	3,725	0	3,206	22,415	5,071	16,084	7,691	28,846
1995	590,940	114,087	4,017	0	3,822	712,866	504,051	26,319	7,603	537,974
1996	17,646	7,849	4,107	0	3,406	33,007	17,436	15,071	8,480	40,987
1997	19,711	10,077	4,120	13	3,695	37,616	25,270	16,567	9,901	51,739
1998	699,276	80,355	4,568	3,174	4,238	791,611	687,053	27,616	8,698	723,366
1999	14,156	10,941	4,652	3,339	3,813	36,900	22,503	14,226	9,234	45,964
2000	32,004	19,256	4,719	4,086	3,788	63,854	44,838	15,155	9,256	69,248
2001	176,979	38,318	4,045	4,316	4,078	227,737	248,894	18,714	9,297	276,905
2002	7,722	2,677	3,824	3,809	3,575	21,606	720	13,469	9,598	23,787
2003	9,747	6,626	3,746	4,018	3,582	27,719	4,110	17,652	9,170	30,931
2004	6,017	2,917	3,879	4,176	3,628	20,616	875	10,662	9,984	21,522
2005	404,441	57,620	3,730	3,260	4,442	473,493	432,183	20,239	9,333	461,755
2006	98,411	10,028	3,744	3,337	3,684	119,204	78,283	16,452	8,953	103,687
2007	7,714	996	3,993	3,802	3,478	19,983	360	10,735	9,967	21,061
2008	57,782	16,465	3,921	2,321	3,921	84,410	69,645	12,246	10,011	91,901
2009	2,362	977	3,395	1,377	3,591	11,703	360	7,032	10,171	17,563
2010	18,906	8,751	4,045	961	3,878	35,904	19,559	18,670	9,991	48,220

Joint Presentation of Surface Water Inflows and Outflows from the Groundwater Sustainability Plans (values in acre-feet per year)										
WMA										
Water Year	Surface Water Inflows						Surface Water Outflows			
	Santa Ynez River (Inflow)	Tributary	Lompoc Wastewater	Imported SWP	River Alluvium Total Inflows	Total Inflows	Santa Ynez River (Outflow)	Net Percolation to Groundwater	River Alluvium Total Outflows	Total Outflows
2011	130,640	27,575	3,190	2,002	3,721	167,129	125,814	21,914	9,170	156,897
2012	3,107	1,753	2,946	2,238	3,625	13,669	720	8,407	10,032	19,159
2013	6,378	624	3,288	2,070	3,652	16,012	360	7,542	11,052	18,594
2014	4,433	430	3,588	145	3,490	12,086	360	8,228	10,584	18,812
2015	3,370	233	3,334	109	3,430	10,475	360	7,495	10,799	14,294
2016	3,823	329	3,324	1,758	3,402	12,637	0	5,776	10,769	16,545
2017	24,538	19,517	3,439	1,924	3,723	53,142	22,633	19,911	10,988	53,532
2018	8,527	438	3,338	2,296	3,374	17,974	360	7,967	10,926	19,253
Historical 1982–2018 Average	91,323	16,132	3,787	1,474	3,577	116,293	89,186	14,300	8,931	112,417

Notes:
Yellow fill indicates the value coordinated between GSAs.
“SWP” is State Water Project.

Table 10
Groundwater Basin-wide Water Budget Historical Average Annuals

Water Component(s)	Flow (acre-feet/year)
Precipitation Recharge (Overlying and Mountain Front)	27,800
Subflow In	1,200
Net Stream Percolation	12,700
Return flows	9,000
Pumping	44,800
Phreatophytes Evapotranspiration (ET)	7,800
Subflow Out	100
Total Groundwater Inflow	50,700
Total Groundwater Outflow	52,700

Table 11
Surface Water Basin-wide Water Budget Historical Average Annuals

Water Budget Component(s)	Flow (acre-feet/year)
Santa Ynez River In	61,600
Tributaries	52,200
Import State Water Project (SWP)	4,600
Underflow and Return Flow Inputs	14,500
Santa Ynez River Out	89,200
State Water Project (SWP) Use	4,600
Net Percolation to Groundwater	12,700
Underflow Outputs	25,600
Total Surface Water Inflow	132,900
Total Surface Water Outflow	132,200

Recommended Corrective Action 3 - “Reevaluate Water Budgets for Consistency”

Excerpt from Staff Recommendation chapter of the *GSP Assessment Staff Report Santa Ynez River Valley Basin (No. 3-015)*, attachment to *Statement of Findings Regarding the Approval of the Santa Ynez River Valley Basin Groundwater Sustainability Plan*, dated January 18, 2024.

The following is RCA#3, part of their GSP Determination for the 3 GSAs:

The GSAs need to reevaluate the water budgets for consistency:

- a. Collectively, in the coordination agreement or otherwise, collaboratively and consistently assess the Basin’s hydrologic conditions, develop consistent groundwater inflows and outflows, assess associated data gaps effecting the water budget (like groundwater level information), and refine the water budgets to show how projected GSA projects and management actions will improve the current and projected groundwater deficits. This assessment should be conducted for the Basin as a whole, and not just the individual management areas.**
- b. Adopt and employ consistent time periods, methods, terminologies, and definitions for the various physical components of the Basin that inform the Basin-wide water budget including the sustainable yield and groundwater change in storage. For example, the GSAs should collectively use the same time periods for the development of their sustainable yields and should clearly explain how releases from Lake Cachuma are managed to effectively regulate the surface water and groundwater system through each of the three management areas.**

Table 3-27. Santa Ynez River Groundwater Basin Eastern Management Area Historical a d Current Water Budget Summaries
Values in acre-feet

Water Budget	Water Year	Rainfall		Surface Water Inflow							Groundwater Inflow							Total Inflow
				Santa Ynez River Inflow	Tributary Inflow	Mountain Front Recharge (River)	Precipitation Recharge	Ag Irrigation Return Flows	Imported	Septic Return Flows	Mountain Front Recharge	Tributary Percolation	Precipitation Recharge	Chumash WWTP Effluent	Septic Return Flows	Ag Irrigation Return Flows	Urban Irrigation Return Flows	
		Inches	% of Average															
Historical	1982	15	92%	4,000	11,100	4,000	100	90	3,000	10	3,300	600	6,600	0	700	3,000	60	36,560
	1983	35	219%	366,200	147,800	8,700	800	70	1,500	10	7,000	700	41,900	0	700	2,800	60	578,240
	1984	7	46%	20,100	3,800	3,900	100	110	5,100	10	1,900	1,600	7,200	0	700	3,400	50	47,970
	1985	11	68%	5,400	2,100	400	0	90	2,700	10	700	300	1,400	0	800	3,200	20	17,120
	1986	17	106%	8,100	21,200	5,700	200	90	2,700	10	4,900	500	10,500	0	800	3,200	30	57,930
	1987	9	56%	4,200	1,700	500	0	100	3,800	10	700	800	2,500	0	800	3,300	40	18,450
	1988	17	105%	4,900	9,700	3,500	200	90	2,800	10	3,800	400	9,800	0	800	3,200	30	39,230
	1989	7	46%	6,700	1,300	500	0	80	2,800	10	400	800	1,200	0	900	2,900	50	17,640
	1990	6	40%	4,800	1,000	0	0	70	800	10	100	300	100	0	900	2,700	40	10,820
	1991	17	105%	5,600	21,000	3,200	100	90	1,700	10	3,100	300	5,500	0	900	3,000	30	44,530
	1992	25	155%	14,800	42,200	6,700	300	80	900	10	6,200	800	14,800	0	900	2,800	40	90,530
	1993	28	174%	284,000	74,400	8,800	500	70	2,000	10	7,200	1,100	27,200	0	900	2,700	10	408,890
	1994	14	84%	9,600	5,200	2,500	100	60	1,800	10	1,700	1,200	6,000	0	900	2,400	10	31,480
	1995	30	187%	360,200	117,200	9,500	500	50	100	10	4,500	600	26,700	0	900	2,300	10	522,570
	1996	12	76%	11,800	5,700	3,500	100	70	2,100	10	1,900	1,300	6,800	0	900	2,500	10	36,690
	1997	12	73%	15,700	13,000	5,800	200	60	2,000	10	5,600	500	11,200	0	900	2,400	10	57,380
	1998	36	226%	397,600	144,000	10,200	700	50	3,500	10	5,900	500	33,500	0	900	2,500	30	599,390
	1999	12	76%	3,100	7,100	3,300	200	70	4,000	10	2,200	1,600	8,700	0	900	2,800	120	34,100
	2000	15	95%	12,900	16,500	7,800	300	70	3,200	10	4,200	500	14,100	0	1,000	3,000	260	63,840
	2001	26	159%	117,900	59,900	8,400	500	70	2,700	10	6,300	700	25,800	0	1,000	2,900	240	226,420
	2002	8	49%	13,700	1,700	100	0	60	2,600	10	200	1,100	1,400	0	1,000	2,600	250	24,720
	2003	17	103%	4,700	14,100	6,900	300	70	5,000	20	4,600	300	12,700	120	1,000	2,700	260	52,770
	2004	10	64%	16,300	5,100	3,000	100	60	3,600	20	1,800	700	6,200	120	1,000	2,500	240	40,740
	2005	35	219%	266,500	108,900	9,600	700	50	4,600	20	6,900	500	34,900	120	1,000	2,400	240	436,430
	2006	18	109%	71,200	20,600	7,900	300	60	4,600	20	5,200	1,600	15,900	120	1,000	2,400	180	131,080
	2007	7	42%	14,300	1,000	0	0	60	4,300	20	0	800	800	120	1,000	2,400	200	25,000
	2008	16	98%	33,300	20,800	6,600	300	60	4,200	20	5,600	300	13,600	120	1,000	2,400	240	88,540
	2009	13	82%	8,700	4,300	900	100	50	3,100	20	1,200	700	3,400	120	1,000	2,300	260	26,150
	2010	21	132%	14,400	19,400	6,200	300	40	4,200	20	4,300	600	12,800	120	1,000	2,100	240	65,720
	2011	26	164%	93,700	54,100	8,900	600	40	5,000	20	7,000	900	30,000	110	1,000	2,100	170	203,640
	2012	12	74%	6,900	4,200	700	100	60	4,400	20	800	1,200	2,700	40	1,000	2,300	190	24,610
	2013	7	42%	16,600	1,600	600	0	60	3,500	20	400	500	700	40	1,000	2,400	210	27,630
	2014	8	49%	10,200	1,200	0	0	60	2,100	20	0	300	100	40	1,100	2,300	220	17,640
	2015	8	50%	14,800	1,800	100	0	70	2,100	20	100	400	100	40	1,100	2,600	170	23,400
	2016	10	62%	13,500	2,500	400	0	50	400	20	300	400	200	40	1,100	2,300	160	21,370
	2017	21	128%	10,100	28,300	5,700	300	60	3,000	20	5,900	400	14,200	40	1,100	2,500	170	71,790
2018	8	49%	14,200	2,700	600	200	50	1,800	20	500	900	8,200	40	1,100	2,300	200	32,810	
	Minimum	6.5	40%	3,100	1,000	0	0	40	100	10	0	300	100	0	700	2,100	10	10,820
	Maximum	36.4	226%	397,600	147,800	10,200	800	110	5,100	20	7,200	1,600	41,900	120	1,100	3,400	260	599,390
	Average	16.1	100%	61,600	27,000	4,200	200	70	2,900	10	3,100	700	11,300	40	900	2,600	130	115,000
% of Total:				54%	23%	4%	0.2%	0.1%	2.5%	0.0%	3%	1%	10%	0.0%	1%	2%	0.1%	
Current	2011	26.3	164%	93,700	54,100	8,900	600	40	5,000	20	7,000	900	30,000	110	1,000	2,100	170	203,640
	2012	11.9	74%	6,900	4,200	700	100	60	4,400	20	800	1,200	2,700	40	1,000	2,300	190	24,610
	2013	6.8	42%	16,600	1,600	600	0	60	3,500	20	400	500	700	40	1,000	2,400	210	27,630
	2014	7.9	49%	10,200	1,200	0	0	60	2,100	20	0	300	100	40	1,100	2,300	220	17,640
	2015	8.1	50%	14,800	1,800	100	0	70	2,100	20	100	400	100	40	1,100	2,600	170	23,400
	2016	10.0	62%	13,500	2,500	400	0	50	400	20	300	400	200	40	1,100	2,300	160	21,370
	2017	20.6	128%	10,100	28,300	5,700	300	60	3,000	20	5,900	400	14,200	40	1,100	2,500	170	71,790
	2018	7.9	49%	14,200	2,700	600	200	50	1,800	20	500	900	8,200	40	1,100	2,300	200	32,810
	Minimum	6.8	42%	6,900	1,200	0	0	40	400	20	0	300	100	40	1,000	2,100	160	17,640
	Maximum	26.3	164%	93,700	54,100	8,900	600	70	5,000	20	7,000	1,200	30,000	110	1,100	2,600	220	203,640
	Average	12.4	77%	22,500	12,100	2,100	200	60	2,790	20	1,900	600	7,000	50	1,100	2,400	200	52,900
% of Total:				43%	23%	4%	0.4%	0.1%	5.3%	0.0%	4%	1%	13%	0.1%	2%	5%	0.4%	

Table 3-27. Santa Ynez River Groundwater Basin Eastern Management Area Historical and Current Water Budget Summaries
Values in acre-feet

Water Budget	Water Year	Rainfall		Surface Water Outflow						Groundwater Outflow													Total Outflow	Change of Groundwater in Storage	Cumulative Change in Storage
				Subsurface Outflow	Surface Outflow	Pumping Extractions			Phreatophyte ET	City of Solvang Pumping	ID No. 1 and SYRWCD Self-Reported Pumping			"White Area" Pumping ¹			Total Pumping	Outflow to Tributaries	Phreatophyte ET	Evaporative Losses	Subsurface Outflow				
		Inches	% of Average			City of Solvang	ID No. 1	SYRWCD			"Agricultural Water" Pumping	"Other Water" Pumping	"Special Irrigation Water" Pumping	Ag Irrigation Pumping	Mutual Water Companies	Rural Domestic Pumping									
Historical	1982	15	92%	1,800	3,900	1,100	300	2,700	4,100	90	4,300	1,000	0	7,200	650	200	13,440	900	3,000	0	100	31,400	-3,180	-3,180	
	1983	35	219%	1,800	511,200	1,200	400	2,400	4,100	90	4,400	1,100	0	7,200	670	200	13,660	17,500	3,100	0	100	555,300	18,800	15,620	
	1984	7	46%	1,800	24,900	1,200	1,000	2,700	4,200	90	4,100	1,000	0	7,200	690	200	13,280	400	3,100	0	100	52,700	-2,030	13,590	
	1985	11	68%	1,800	2,700	1,300	700	2,900	4,100	100	4,800	1,200	0	7,200	710	200	14,210	0	3,100	0	100	30,900	-10,990	2,600	
	1986	17	106%	1,800	12,300	1,300	500	3,000	4,100	110	4,700	1,100	0	7,700	730	200	14,540	1,700	3,100	0	100	42,500	490	3,090	
	1987	9	56%	1,800	1,900	1,300	700	3,300	4,100	100	4,000	700	0	7,800	740	200	13,540	0	3,100	0	100	29,700	-8,600	-5,510	
	1988	17	105%	1,800	4,100	1,400	700	3,100	4,100	30	4,600	1,100	0	7,800	740	200	14,470	1,300	3,100	0	100	34,400	-940	-6,450	
	1989	7	46%	1,800	1,800	1,300	600	3,500	4,100	20	4,100	2,900	0	7,800	750	200	15,770	0	3,100	0	100	32,000	-12,720	-19,170	
	1990	6	40%	1,800	600	1,400	700	3,300	4,200	20	4,100	3,900	0	7,700	760	200	16,680	0	3,100	0	100	31,700	-15,740	-34,910	
	1991	17	105%	1,800	12,400	1,100	1,600	2,900	4,100	150	4,800	1,200	0	7,600	770	200	14,720	700	3,000	0	100	42,500	-5,690	-40,600	
	1992	25	155%	1,800	40,100	1,200	1,200	3,000	4,200	130	5,000	1,300	0	7,600	780	200	15,010	3,700	3,100	0	100	73,400	3,630	-36,970	
	1993	28	174%	1,800	364,100	400	1,400	2,000	4,200	470	4,200	2,100	0	7,400	780	200	15,150	8,300	3,100	0	100	400,600	12,460	-24,510	
	1994	14	84%	1,800	9,400	600	2,000	1,800	4,200	350	3,300	1,800	0	7,300	790	300	13,840	200	3,100	0	100	36,800	-5,030	-29,540	
	1995	30	187%	1,800	533,900	500	800	2,100	4,100	490	3,900	2,400	0	7,200	800	300	15,090	6,000	3,000	0	100	567,400	10,820	-18,720	
	1996	12	76%	1,800	15,900	1,000	1,100	2,100	4,200	310	4,500	3,000	0	7,100	810	300	16,020	400	3,100	0	100	45,700	-6,210	-24,930	
	1997	12	73%	1,800	15,300	1,000	100	2,400	4,200	480	3,600	2,300	0	7,700	810	300	15,190	2,100	3,100	0	100	45,300	120	-24,810	
	1998	36	226%	1,800	655,500	900	0	2,300	4,100	500	3,000	1,800	60	8,300	820	300	14,780	10,900	3,000	0	100	693,300	14,550	-10,260	
	1999	12	76%	1,800	11,000	900	1,500	3,000	4,000	480	3,300	1,900	20	9,000	830	300	15,830	600	3,000	0	100	41,700	-3,210	-13,470	
	2000	15	95%	1,800	24,200	700	2,000	4,200	4,200	560	3,400	1,800	10	9,700	830	300	16,600	2,500	3,100	0	100	59,500	760	-12,710	
	2001	26	159%	1,800	157,900	300	3,100	4,100	4,100	740	3,100	1,400	10	9,200	840	300	15,590	5,800	3,100	0	100	196,000	12,350	-360	
	2002	8	49%	1,800	8,500	300	900	4,000	4,100	370	2,900	1,100	20	8,700	840	300	14,230	0	3,100	0	100	36,900	-10,880	-11,240	
	2003	17	103%	1,800	7,700	200	2,700	3,700	4,100	200	2,900	1,200	10	8,700	850	300	14,160	2,200	3,100	0	100	39,700	2,120	-9,120	
	2004	10	64%	1,800	10,100	300	1,000	3,700	4,200	180	2,800	1,300	20	8,800	860	300	14,260	300	3,100	0	100	38,900	-5,200	-14,320	
	2005	35	219%	1,800	373,600	100	1,000	3,200	4,100	140	2,300	1,200	20	8,800	860	300	13,620	13,400	3,000	0	100	413,800	15,940	1,620	
	2006	18	109%	1,800	96,500	100	1,500	3,000	4,200	100	2,500	1,400	20	8,700	870	300	13,890	3,200	3,100	0	100	127,200	6,110	7,730	
	2007	7	42%	1,800	10,900	200	1,500	3,100	4,100	140	3,100	1,800	20	8,500	880	300	14,740	0	3,100	0	100	39,500	-12,620	-4,890	
	2008	16	98%	1,800	49,600	200	1,700	3,300	4,100	190	3,300	2,100	30	8,300	880	300	15,100	2,900	3,100	0	100	81,800	2,060	-2,830	
	2009	13	82%	1,800	4,800	200	1,600	3,600	4,200	160	2,900	1,800	20	8,300	890	300	14,370	100	3,100	0	100	33,700	-8,690	-11,520	
	2010	21	132%	1,800	18,600	200	400	3,300	4,100	140	2,700	1,300	20	8,200	890	300	13,550	2,000	3,000	0	100	46,900	2,510	-9,010	
	2011	26	164%	1,800	120,400	100	500	2,600	4,100	0	2,800	1,500	20	8,100	900	300	13,620	10,000	3,000	0	100	156,300	14,560	5,550	
	2012	12	74%	1,800	4,900	100	1,100	3,900	4,100	110	3,200	2,200	30	8,000	910	300	14,750	0	3,100	0	100	33,800	-9,720	-4,170	
	2013	7	42%	1,800	11,500	200	1,400	3,900	4,200	180	3,600	2,400	20	8,000	910	300	15,410	0	3,100	0	100	41,700	-13,360	-17,530	
	2014	8	49%	1,800	6,100	200	1,700	4,000	4,200	290	3,400	2,200	20	8,100	920	300	15,230	0	3,100	0	100	36,500	-14,370	-31,900	
	2015	8	50%	1,800	9,500	300	2,200	4,100	4,300	230	3,300	1,800	10	8,600	930	300	15,170	0	3,200	0	100	40,500	-13,960	-45,860	
	2016	10	62%	1,800	8,000	400	600	3,800	4,200	290	3,200	1,600	10	9,000	930	300	15,330	0	3,100	0	100	37,200	-14,030	-59,890	
	2017	21	128%	1,800	18,700	300	1,400	4,500	4,200	190	3,000	1,700	10	9,000	940	300	15,140	3,000	3,100	0	100	52,100	2,970	-56,920	
2018	8	49%	1,800	9,300	300	1,200	3,300	4,200	370	2,900	1,700	10	9,000	950	300	15,230	0	3,100	0	100	38,500	-5,190	-62,110		
	Minimum	6.5	40%	1,800	600	100	0	1,800	4,000	0	2,300	700	0	7,100	650	200	13,280	0	3,000	0	100	29,700	-15,740		

CMA

Table 2c.3-6
Annual Groundwater Inflows, Outflow, and Change in Storage, Historical Period (1982 through 2018), AFY

		Inflows						Outflows						
Water Year	Hydrologic Year Type	Subflow In	Precipitation Recharge-Overlying	Mountain Front Recharge	Net Stream Percolation	Agricultural Return Flows	Urban Return Flows	Agricultural Pumping	Municipal Pumping	Domestic Pumping	Phreatophytes	Subflow Out	Change in Storage	Cumulative Change in Storage
1982	Dry	85	1,873	768	161	466	23	2,364	221	53	88	700	-51	-51
1983	Wet	85	3,557	768	1,137	442	19	2,240	266	44	88	700	2,670	2,619
1984	Below normal	85	2,088	768	262	510	21	2,582	405	48	88	683	-72	2,547
1985	Dry	85	1,998	768	139	527	19	2,659	335	43	88	673	-264	2,283
1986	Above normal	85	2,115	768	451	457	23	2,308	426	53	88	609	414	2,697
1987	Dry	85	1,463	768	124	482	26	2,438	487	60	88	504	-628	2,068
1988	Dry	85	1,779	768	114	464	28	2,347	326	63	88	610	-197	1,871
1989	Critically Dry	85	1,267	768	34	512	32	2,590	205	72	88	526	-783	1,089
1990	Critically Dry	85	1,044	768	12	531	40	2,683	288	91	88	483	-1,155	-66
1991	Below normal	85	1,634	768	227	465	44	2,357	90	100	88	504	84	18
1992	Above normal	85	2,321	768	446	367	45	1,859	315	103	88	483	1,184	1,201
1993	Wet	85	2,654	768	757	280	39	1,427	223	89	88	526	2,230	3,431
1994	Below normal	85	1,584	768	203	255	37	1,302	436	84	88	801	220	3,651
1995	Wet	85	2,834	768	1,470	208	39	1,068	385	88	88	780	2,993	6,645
1996	Below normal	85	1,668	768	292	242	38	1,241	301	86	88	695	681	7,326
1997	Above normal	85	1,677	768	424	250	39	1,280	374	88	88	1,056	356	7,682
1998	Wet	85	3,216	768	1,361	241	39	1,226	115	89	88	907	3,285	10,967
1999	Above normal	85	2,171	768	408	342	72	1,739	138	165	88	886	831	11,798
2000	Above normal	85	2,124	768	488	396	85	2,014	173	192	88	865	613	12,412
2001	Wet	85	2,676	768	771	429	91	2,232	362	206	88	928	1,004	13,415
2002	Dry	85	1,568	768	164	388	101	2,104	318	230	88	780	-446	12,969
2003	Below normal	85	1,757	768	270	291	107	1,676	325	243	88	844	102	13,071
2004	Dry	85	1,540	768	121	365	114	2,130	226	260	88	971	-682	12,390
2005	Wet	85	3,394	768	1,046	334	109	1,960	89	248	88	1,119	2,231	14,620
2006	Above normal	85	2,069	768	364	259	116	1,717	79	264	88	1,056	457	15,077
2007	Critically Dry	85	1,281	768	65	321	129	2,133	442	294	88	907	-1,215	13,862
2008	Above normal	85	2,119	768	451	444	154	2,729	663	351	88	632	-441	13,421
2009	Critically Dry	85	1,417	768	71	483	139	2,988	788	317	88	695	-1,913	11,507
2010	Below normal	85	2,056	768	259	403	118	2,617	718	268	88	441	-444	11,063
2011	Wet	85	2,075	768	629	310	120	2,194	667	272	88	399	367	11,430
2012	Dry	85	1,585	768	118	338	113	2,573	331	258	88	526	-768	10,663
2013	Critically Dry	85	1,236	768	35	397	112	2,925	546	255	88	165	-1,347	9,315
2014	Critically Dry	85	1,077	768	23	467	123	3,173	527	279	88	314	-1,839	7,476
2015	Critically Dry	85	968	768	10	437	122	3,244	786	278	88	504	-2,510	4,966
2016	Critically Dry	85	997	768	16	365	110	2,868	625	249	88	526	-2,016	2,950
2017	Above normal	85	1,552	768	410	360	112	2,856	296	255	88	886	-1,095	1,855
2018	Critically Dry	85	890	768	22	276	109	2,415	350	249	88	844	-1,796	60
Average 1982 - 2018		90	1,870	770	360	380	80	2,220	370	170	90	690	0	

WMA

Table 2c.3-6
Annual Groundwater Inflows, Outflow, and Change in Storage,
Historical Period (1982 through 2018), AFY

		Inflows						Outflows						
Water Year	Hydrologic Year Type	Subflow In	Precipitation Recharge-Overlying	Mountain Front Recharge	Net Stream Percolation	Agricultural Return Flows	Urban Return Flows	Agricultural Pumping	Municipal Pumping	Domestic Pumping	Phreatophytes	Subflow Out	Change in Storage	Cumulative Change in Storage
1982	Dry	1,200	6,583	2,086	9,517	3,387	623	17,031	6,443	203	4,914	100	-5,293	-5,293
1983	Wet	1,200	10,570	4,919	28,131	2,967	613	14,924	6,110	218	4,914	100	22,134	16,841
1984	Below normal	1,200	8,496	2,450	17,657	3,223	845	16,209	6,990	235	4,914	100	5,424	22,265
1985	Dry	1,200	7,756	2,288	8,070	3,276	830	16,463	7,503	260	4,914	100	-5,819	16,446
1986	Above normal	1,200	8,941	2,380	19,973	3,413	922	17,134	8,510	279	4,914	100	5,894	22,339
1987	Dry	1,200	6,359	2,907	9,665	4,292	907	21,548	8,126	259	4,914	100	-9,616	12,723
1988	Dry	1,200	8,799	3,657	8,249	3,912	1,019	19,647	8,732	242	3,718	100	-5,602	7,121
1989	Critically Dry	1,200	5,194	3,091	4,224	3,912	1,063	19,656	9,219	213	3,464	100	-13,968	-6,847
1990	Critically Dry	1,200	5,669	2,875	3,888	4,104	1,018	20,617	7,945	222	3,464	100	-13,595	-20,442
1991	Below normal	1,200	8,113	2,906	14,458	3,977	897	19,976	7,173	224	4,533	100	-455	-20,897
1992	Above normal	1,200	7,526	2,367	22,267	4,058	910	20,362	7,365	211	4,914	100	5,375	-15,522
1993	Wet	1,200	8,965	3,172	22,844	3,984	903	20,029	7,890	226	4,914	100	7,909	-7,614
1994	Below normal	1,200	7,056	1,908	16,084	3,511	937	17,680	8,144	214	4,914	100	-355	-7,969
1995	Wet	1,200	11,637	4,828	26,319	3,020	853	15,213	7,656	220	4,914	100	19,754	11,785
1996	Below normal	1,200	6,769	1,976	15,071	3,803	955	19,154	8,181	216	4,914	100	-2,791	8,994
1997	Above normal	1,200	6,326	2,028	16,567	5,005	1,094	25,165	8,114	224	4,914	100	-6,296	2,697
1998	Wet	1,200	14,080	4,392	27,616	3,640	888	18,297	7,230	186	4,914	100	21,090	23,788
1999	Above normal	1,200	7,874	2,774	14,226	4,192	984	21,084	7,631	211	4,914	100	-2,689	21,098
2000	Above normal	1,200	8,643	2,707	15,155	4,430	1,055	22,303	7,952	214	4,914	100	-2,292	18,806
2001	Wet	1,200	10,054	2,888	18,714	4,314	1,068	21,767	7,392	224	4,914	100	3,842	22,649
2002	Dry	1,200	7,286	1,730	13,469	4,420	1,143	22,399	7,953	234	4,914	100	-6,352	16,297
2003	Below normal	1,200	7,231	1,787	17,652	3,509	1,122	17,906	7,841	223	4,914	100	1,517	17,814
2004	Dry	1,200	6,901	1,738	10,662	3,700	1,198	18,969	8,099	224	4,914	100	-6,907	10,908
2005	Wet	1,200	11,851	4,367	20,239	3,550	1,096	18,162	7,351	238	4,914	100	11,539	22,446
2006	Above normal	1,200	9,141	2,462	16,452	3,212	1,130	16,643	7,642	245	4,914	100	4,053	26,499
2007	Critically Dry	1,200	4,831	1,319	10,735	3,573	1,258	18,596	8,225	280	4,914	100	-9,199	17,300
2008	Above normal	1,200	8,364	2,285	12,246	3,566	1,250	18,537	8,215	297	4,914	100	-3,151	14,149
2009	Critically Dry	1,200	7,971	1,567	7,032	3,785	1,183	19,712	7,402	326	4,914	100	-9,717	4,432
2010	Below normal	1,200	9,131	2,687	18,670	3,837	1,052	19,989	6,892	309	4,914	100	4,374	8,807
2011	Wet	1,200	9,521	3,508	21,914	3,460	1,154	18,139	6,879	309	4,914	100	10,415	19,221
2012	Dry	1,200	8,753	2,306	8,407	4,145	1,097	21,862	6,901	281	4,914	100	-8,149	11,073
2013	Critically Dry	1,200	6,978	2,684	7,542	4,753	1,100	24,959	7,296	282	3,464	100	-11,844	-771
2014	Critically Dry	1,200	6,481	2,930	8,228	4,052	1,021	21,297	7,153	297	3,464	100	-8,400	-9,172
2015	Critically Dry	1,200	5,246	2,752	3,495	4,090	853	21,761	6,083	281	3,464	100	-14,053	-23,225
2016	Critically Dry	1,200	6,466	2,924	5,776	3,904	859	20,934	6,138	244	3,464	100	-9,751	-32,976
2017	Above normal	1,200	8,215	2,501	19,911	3,812	835	20,419	5,945	239	4,744	100	5,027	-27,949
2018	Critically Dry	1,200	5,914	2,708	7,967	3,622	895	19,451	6,374	254	4,914	100	-8,786	-36,734
Average 1982 - 2018		1,200	7,990	2,730	14,300	3,820	990	19,570	7,480	240	4,630	100	(990)	

Table 3-23. Annual Surface Water Outflow, Historical Period (1982 through 2018)

(Values in acre-feet per year)

Surface Water Outflow Component	Average	Minimum ¹	Maximum ¹
Santa Ynez River Outflow (including Zaca Creek)	85,700	600	655,500
Pumping (River Wells)	5,000	1,900	9,000
Subsurface Outflow	1,800	1,800	1,800
Phreatophyte ET	4,100	4,000	4,300
Total	96,600	—	—

Note¹ Minimum and maximum values are not totaled because the values for each component may have occurred in different years.

ET = evapotranspiration

Note that imported water from SWP Table A, Exchange Agreement, and the Cachuma Project sources are included as an inflow component in the water budgets. The outflow of this water, along with the commingled water from Santa Ynez Uplands groundwater sources includes consumptive use, percolation as irrigation return flow and urban irrigation return flow (which includes system leakage) and septic system return flow. The remainder of this water flows to the municipal treatment plant, which serves the City of Solvang, where it is percolated back into the Santa Ynez River Alluvium downstream and outside of the EMA. Subsurface outflow through the Santa Ynez River Alluvium has been calculated using Darcy's law with estimated values for hydraulic conductivity, average hydraulic gradient, and outflow plane cross-sectional area near the downstream shared border with the CMA (based on relatively steady saturated thickness estimates). This estimate was made in coordination with Stetson Engineers for the downstream CMA, where this same volume of outflow is accounted for as inflow to the CMA. Furthermore, these flow volumes have been verified by the numerical groundwater models being created separately for the CMA and EMA.

Components of surface water outflow vary less than inflow components. Whereas the variability of inflow is large, the extraction by phreatophytes is continual during most climatic conditions and subsurface outflow is very steady due to a stable subsurface hydraulic gradient at the western end of the Santa Ynez River Alluvium.

The estimated average annual total outflow from these surface water sources for the historical period is approximately 96,600 AFY. The largest component of this outflow is gauged surface flow within the Santa Ynez River near the City of Solvang and flow through Zaca Creek near the intersection of Highways 101 and 154, which together total 89 percent of the total surface water outflow. The remainder of the surface water outflow, or 11 percent of the total, leaves the EMA through the Santa Ynez River Alluvium either as subsurface outflow near the City of Solvang; pumping by the City of Solvang, ID No. 1 and other users; or phreatophyte ET. The large difference between the minimum and maximum outflows reflects the difference between dry and wet years in the EMA and contributing watershed.

3.3.3.3 Groundwater Inflows and Outflows

During the historical period from water year 1982 through water year 2018, groundwater from both of the two principal aquifers (the Paso Robles Formation and the Careaga Sand) supplied a vast majority of the water used in the EMA. This section presents a summary of estimated groundwater inflows, groundwater outflows, and a change of groundwater in storage under historical conditions.



Table 2c.3-1
Annual Surface Water Inflow, Historical Period (1982 through 2018)

Surface Water Inflow Component	Average	Minimum	Maximum ¹
	(Acre-Feet per Year)		
Santa Ynez River Inflow from EMA	85,720	630	655,470
Santa Ynez River Tributary Inflow	9,060	70	61,820
Imported SWP	230	0	670
<i>Santa Ynez River Alluvium Subarea (Surface Water Underflow)</i>			
Subsurface inflow ^A	2,490	1,970	2,920
Recharge from Precipitation (Overlying and Mountain Front)	880	530	1,490
Recharge from Agricultural Return Flows to Underflow	480	340	710
Recharge from Municipal Return Flows to Underflow ^B	1,240	1,000	1,460
Recharge from Domestic Return Flows to Underflow	100	30	170
TOTAL	100,200	4,570	724,710

^A Includes underflow from the Santa Ynez River Alluvium in the EMA and subflow from the Buellton Upland.

^B Includes percolation return flow from both City of Buellton and City of Solvang wastewater treatment plants.

2c.3-1-2 Surface Water Outflows

The estimated annual average total surface water outflow leaving the CMA as flow in the Santa Ynez River, within the Santa Ynez River Alluvium Upper Aquifer, and percolation into Lower Aquifer over the historical base period is summarized in **Table 2c.3-2**. Similar to inflows, the Santa Ynez River surface outflow represents the majority (91%) off the average annual surface flow out of the CMA.



Table 2c.3-2
Annual Surface Water Outflow, Historical Period (1982 through 2018)

Surface Water Outflow Component	Average	Minimum	Maximum ¹
	(Acre-Feet per Year)		
Santa Ynez River Outflow to WMA	91,320	40	699,280
Net Channel Percolation to Groundwater ^A	360	10	1,470
<i>Santa Ynez River Alluvium Subarea (Surface Water Underflow)</i>			
<i>Santa Ynez River Underflow Out</i>	800	800	800
<i>River well pumping – Agriculture^B</i>	2,720	1,920	3,690
<i>River well pumping – Municipal^B</i>	470	80	1,020
<i>River well pumping – Domestic^B</i>	225	70	380
<i>Riparian Vegetation Evapotranspiration</i>	4,165	4,165	4,165
TOTAL	100,070	7,085	710,805

^A Does not include percolation to Santa Ynez River Alluvium, which is part of the surface water component.

^B River well pumping occurs from wells in the Santa Ynez River Alluvium. The wells pump from the underflow of the Santa Ynez River and are administered by the SWRCB as a surface water diversion.

2c.3-1-3 Summary

As indicated in Tables 2c.3-1 and 2c.3-2, the average surface flow in and out averaged 100,200 AFY and 100,070 AFY, respectively, for the historical period (1982 through 2018). The surface water inflow exceeded outflow by 130 AFY.

The surface water budget for the historical period in the CMA is presented on **Figure 2c.3-1** and **Table 2c.3-3**. The inflows and outflows for the Santa Ynez River Alluvium shown in Tables 2c.3-1 and 2c.3-2 are totaled in Figure 2c.3-1 and Table 2c.3-3. The figure shows how flashy the hydrologic system is, with ten wet years showing orders of magnitude more flux of surface water than the other, drier, years. In these wet years, surface water inflows and outflows are extremely large in response to precipitation, compared with the drier years.

Imported surface water from the SWP became available after completion of the Coastal Branch pipeline in 1997. The VSFB has an SWP allocation of 5,500 AFY and a drought buffer of 550 AFY for a total of 6,050 AFY.

Table 2c.3-1 summarizes the average, minimum, and maximum inflow from surface water from all sources. The estimated average annual total inflow over the historical base period is approximately 116,290 AFY. The large difference between the minimum and maximum inflows reflects the climatic variability between dry and wet years. The largest components of this average local inflow are releases from Bradbury Dam and flow in the Santa Ynez River upstream of the WMA, which represent about 78% of the average annual surface inflow. Inflow from the Lompoc and Santa Rita Upland and the Santa Ynez Mountains contributes 14% of the total surface water inflow. The remaining surface flow components make up 8% of the total surface water inflow (**Table 2c.3-1**).

Table 2c.3-1
Annual Surface Water Inflow, Historical Period (1982 through 2018)

Surface Water Inflow Component	Average	Minimum	Maximum
	(Acre-Feet per Year)		
Santa Ynez River Inflow from CMA	91,320	40	699,280
Santa Ynez River Tributary Inflow	16,130	230	114,090
Lompoc Regional Wastewater Reclamation Plant	3,790	2,950	4,720
Imported SWP	1,470	0	4,320
<i>Santa Ynez River Alluvium Subarea (Surface Water Underflow)</i>			
<i>Subsurface inflow</i>	800	800	800
<i>Recharge from Precipitation (Overlying and Mountain Front)</i>	1,900	1,400	2,750
<i>Recharge from Agricultural Return Flows to Underflow</i>	860	450	1,250
<i>Recharge from Domestic Return Flows to Underflow</i>	20	0	40
TOTAL	116,290	5,870	827,250

The annual average, minimum, and maximum volumes of imported local surface water during the historical base period (1982 through 2018) are presented Table 2c.3-1. The average value of 1,470 AFY does not represent the typical SWP imports by the VSFB because deliveries did not start until 1997. The average amount of SWP imports for the period of 1998–2018 was approximately 2,600 AFY. The imported water supply provides approximately zero to 2% of the total volume of surface water that enters the WMA.

2c.3-1-2 Surface Water Outflows

The estimated annual average total surface water outflow leaving the WMA as flow in the Santa Ynez River, within the Santa Ynez River Alluvium Upper Aquifer, and percolation into Lower Aquifer over the historical base period is summarized in **Table 2c.3-2**. Similar to inflows, the Santa Ynez River surface outflow represents the majority (79%) off the average annual surface flow out of the WMA.

Table 2c.3-2
Annual Surface Water Outflow, Historical Period (1982 through 2018)

Surface Water Outflow Component	Average	Minimum	Maximum
	(Acre-Feet per Year)		
Santa Ynez River Outflow to Pacific Ocean	89,190	0	687,050
Net Channel Percolation to Groundwater ^A	14,300	3,500	28,130
<i>Santa Ynez River Alluvium Subarea (Surface Water Underflow)</i>			
<i>Santa Ynez River Underflow Out</i>	1,200	1,200	1,200
<i>River well pumping ^B – Agriculture</i>	4,510	2,340	6,620
<i>River well pumping ^B – Domestic</i>	50	10	100
<i>Riparian Vegetation Evapotranspiration</i>	3,170	3,170	3,170
TOTAL	112,420	10,220	726,270

A Does not include percolation to Santa Ynez River Alluvium, which is part of the surface water component.

B River well pumping occurs from wells in the Santa Ynez River Alluvium upstream of the Lompoc Narrows. The wells pump from the underflow of the Santa Ynez River and are administered by the SWRCB as a surface water diversion.

WMA

Table 2c.3-3
Annual Surface Water Components, Historical Period (1982 through 2018), AFY

		Inflows						Outflows				
Water Year	Hydrologic Year Type	Santa Ynez River	Tributary	Lompoc Wastewater	Imported SWP	River Alluvium Total Inflows	Total Inflows	Santa Ynez River	Net Percolation to Groundwater	River Alluvium Total Outflows	Total Outflows	Inflow - Outflow
1982	Dry	3,402	2,902	3,583	0	3,289	13,175	1,592	9,517	7,433	18,542	-5,367
1983	Wet	539,648	64,565	3,786	0	4,112	612,111	499,844	28,131	7,286	535,262	76,849
1984	Below normal	26,082	6,168	3,666	0	3,363	39,279	22,370	17,657	7,267	47,295	-8,015
1985	Dry	562	2,297	3,968	0	3,260	10,087	0	8,070	6,957	15,028	-4,940
1986	Above normal	14,906	19,078	4,090	0	3,275	41,350	20,688	19,973	6,723	47,384	-6,034
1987	Dry	1,392	2,896	4,107	0	2,960	11,355	654	9,665	6,800	17,120	-5,765
1988	Dry	1,320	1,688	3,944	0	3,122	10,073	0	8,249	6,813	15,062	-4,989
1989	Critically Dry	109	400	4,019	0	3,014	7,542	0	4,224	7,579	11,804	-4,261
1990	Critically Dry	39	317	3,707	0	3,070	7,134	0	3,888	8,415	12,303	-5,170
1991	Below normal	11,091	9,445	3,616	0	3,293	27,446	13,782	14,458	8,022	36,263	-8,817
1992	Above normal	43,968	12,689	3,691	0	3,602	63,950	47,843	22,267	7,814	77,923	-13,973
1993	Wet	377,397	30,539	3,889	0	3,748	415,572	382,370	22,844	7,698	412,911	2,660
1994	Below normal	10,416	5,068	3,725	0	3,206	22,415	5,071	16,084	7,691	28,846	-6,430
1995	Wet	590,940	114,087	4,017	0	3,822	712,866	504,051	26,319	7,603	537,974	174,893
1996	Below normal	17,646	7,849	4,107	0	3,406	33,007	17,436	15,071	8,480	40,987	-7,979
1997	Above normal	19,711	10,077	4,120	13	3,695	37,616	25,270	16,567	9,901	51,739	-14,123
1998	Wet	699,276	80,355	4,568	3,174	4,238	791,611	687,053	27,616	8,698	723,366	68,245
1999	Above normal	14,156	10,941	4,652	3,339	3,813	36,900	22,503	14,226	9,234	45,964	-9,064
2000	Above normal	32,004	19,256	4,719	4,086	3,788	63,854	44,838	15,155	9,256	69,248	-5,395
2001	Wet	176,979	38,318	4,045	4,316	4,078	227,737	248,894	18,714	9,297	276,905	-49,168
2002	Dry	7,722	2,677	3,824	3,809	3,575	21,606	720	13,469	9,598	23,787	-2,180
2003	Below normal	9,747	6,626	3,746	4,018	3,582	27,719	4,110	17,652	9,170	30,931	-3,213
2004	Dry	6,017	2,917	3,879	4,176	3,628	20,616	875	10,662	9,984	21,522	-906
2005	Wet	404,441	57,620	3,730	3,260	4,442	473,493	432,183	20,239	9,333	461,755	11,738
2006	Above normal	98,411	10,028	3,744	3,337	3,684	119,204	78,283	16,452	8,953	103,687	15,516
2007	Critically Dry	7,714	996	3,993	3,802	3,478	19,983	360	10,735	9,967	21,061	-1,078
2008	Above normal	57,782	16,465	3,921	2,321	3,921	84,410	69,645	12,246	10,011	91,901	-7,491
2009	Critically Dry	2,362	977	3,395	1,377	3,591	11,703	360	7,032	10,171	17,563	-5,860
2010	Below normal	18,906	8,751	3,408	961	3,878	35,904	19,559	18,670	9,991	48,220	-12,316
2011	Wet	130,640	27,575	3,190	2,002	3,721	167,129	125,814	21,914	9,170	156,897	10,232
2012	Dry	3,107	1,753	2,946	2,238	3,625	13,669	720	8,407	10,032	19,159	-5,490
2013	Critically Dry	6,378	624	3,288	2,070	3,652	16,012	0	7,542	11,052	18,594	-2,582
2014	Critically Dry	4,433	430	3,588	145	3,490	12,086	0	8,228	10,584	18,812	-6,727
2015	Critically Dry	3,370	233	3,334	109	3,430	10,475	0	3,495	10,799	14,294	-3,819
2016	Critically Dry	3,823	329	3,324	1,758	3,402	12,637	0	5,776	10,769	16,545	-3,908
2017	Above normal	24,538	19,517	3,439	1,924	3,723	53,142	22,633	19,911	10,988	53,532	-389
2018	Critically Dry	8,527	438	3,338	2,296	3,374	17,974	360	7,967	10,926	19,253	-1,279
Average 1982 - 2018		91,323	16,132	3,787	1,474	3,577	116,293	89,186	14,300	8,931	112,417	3,876

CMA

Table 2c.3-3
Annual Surface Water Components, Historical Period (1982 through 2018), AFY

		Inflows					Outflows				
Water Year	Hydrologic Year Type	Santa Ynez River	Tributary	Imported SWP	River Alluvium Total Inflows	Total Inflows	Santa Ynez River	Net Percolation to Groundwater	River Alluvium Total Outflows	Total Outflows	Inflow - Outflow
1982	Dry	3,916	1,403	0	5,125	10,445	3,402	161	9,239	12,801	-2,357
1983	Wet	511,215	35,305	0	5,721	552,242	539,648	1,137	8,890	549,675	2,566
1984	Below normal	24,859	2,955	0	5,236	33,049	26,082	262	9,126	35,470	-2,421
1985	Dry	2,677	937	0	5,129	8,742	562	139	8,656	9,358	-615
1986	Above normal	12,297	10,412	0	5,034	27,742	14,906	451	8,144	23,501	4,241
1987	Dry	1,853	1,374	0	4,735	7,961	1,392	124	8,228	9,743	-1,782
1988	Dry	4,119	720	0	4,995	9,834	1,320	114	8,209	9,643	191
1989	Critically Dry	1,758	155	0	4,765	6,677	109	34	8,568	8,712	-2,035
1990	Critically Dry	629	84	0	4,702	5,416	39	12	8,771	8,821	-3,406
1991	Below normal	12,361	5,477	0	4,816	22,654	11,091	227	8,429	19,747	2,907
1992	Above normal	40,134	8,366	0	5,085	53,585	43,968	446	8,039	52,453	1,132
1993	Wet	364,086	18,499	0	5,258	387,844	377,397	757	7,857	386,011	1,833
1994	Below normal	9,390	2,468	0	5,193	17,050	10,416	203	7,806	18,425	-1,375
1995	Wet	533,933	61,822	0	5,641	601,396	590,940	1,470	7,670	600,081	1,315
1996	Below normal	15,892	3,624	0	5,206	24,722	17,646	292	7,900	25,838	-1,116
1997	Above normal	15,294	6,532	74	5,584	27,484	19,711	424	8,042	28,176	-692
1998	Wet	655,470	49,154	609	5,905	711,137	699,276	1,361	7,199	707,836	3,301
1999	Above normal	10,953	5,491	569	5,522	22,535	14,156	408	7,914	22,478	57
2000	Above normal	24,183	9,991	602	5,579	40,356	32,004	488	8,170	40,662	-306
2001	Wet	157,890	22,082	384	5,825	186,181	176,979	771	7,867	185,617	564
2002	Dry	8,544	1,222	584	5,234	15,584	7,722	164	7,841	15,727	-143
2003	Below normal	7,711	3,344	530	5,409	16,994	9,747	270	7,970	17,987	-993
2004	Dry	10,147	1,484	511	5,521	17,663	6,017	121	8,674	14,812	2,851
2005	Wet	373,556	33,659	511	5,984	413,710	404,441	1,046	8,583	414,069	-359
2006	Above normal	96,498	5,477	641	5,528	108,144	98,411	364	8,332	107,108	1,036
2007	Critically Dry	10,885	469	665	5,173	17,192	7,714	65	8,632	16,411	781
2008	Above normal	49,596	10,337	513	5,238	65,684	57,782	451	8,497	66,730	-1,046
2009	Critically Dry	4,753	481	293	4,908	10,435	2,362	71	8,345	10,779	-344
2010	Below normal	18,594	4,572	226	5,091	28,483	18,906	259	8,246	27,411	1,071
2011	Wet	120,436	15,004	394	5,008	140,841	130,640	629	7,994	139,264	1,577
2012	Dry	4,862	763	582	5,003	11,210	3,107	118	8,734	11,959	-748
2013	Critically Dry	11,520	250	216	4,591	16,577	6,378	35	8,923	15,335	1,242
2014	Critically Dry	6,118	165	32	4,632	10,947	4,433	23	8,974	13,429	-2,483
2015	Critically Dry	9,518	73	0	4,633	14,224	3,370	10	8,719	12,099	2,125
2016	Critically Dry	8,006	116	82	4,638	12,842	3,823	16	8,649	12,488	354
2017	Above normal	18,652	10,820	293	5,255	35,020	24,538	410	9,026	33,974	1,046
2018	Critically Dry	9,315	162	224	5,035	14,735	8,527	22	9,239	17,788	-3,053
Average 1982 - 2018		85,720	9,060	230	5,190	100,200	91,320	360	8,380	100,070	130

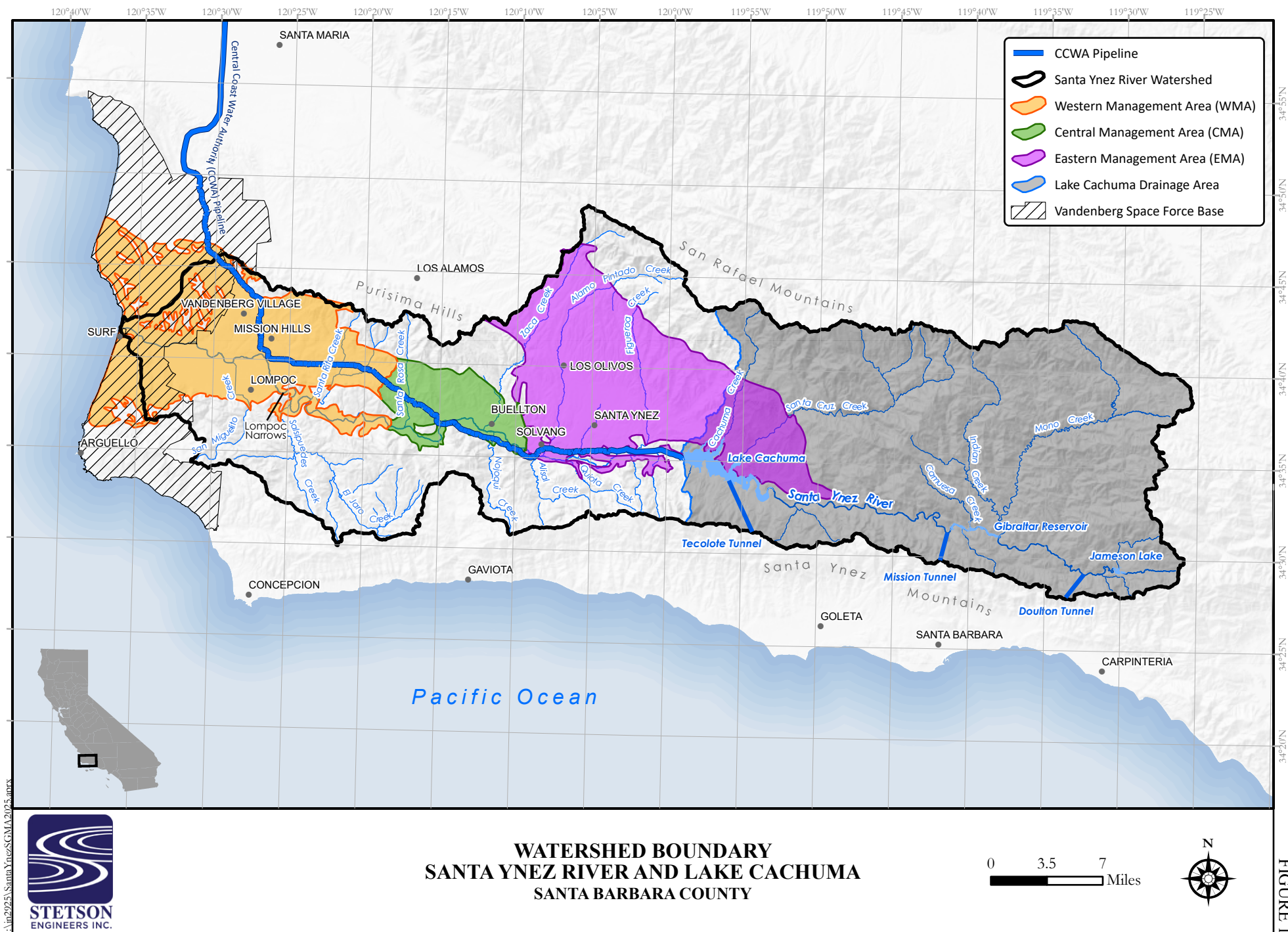
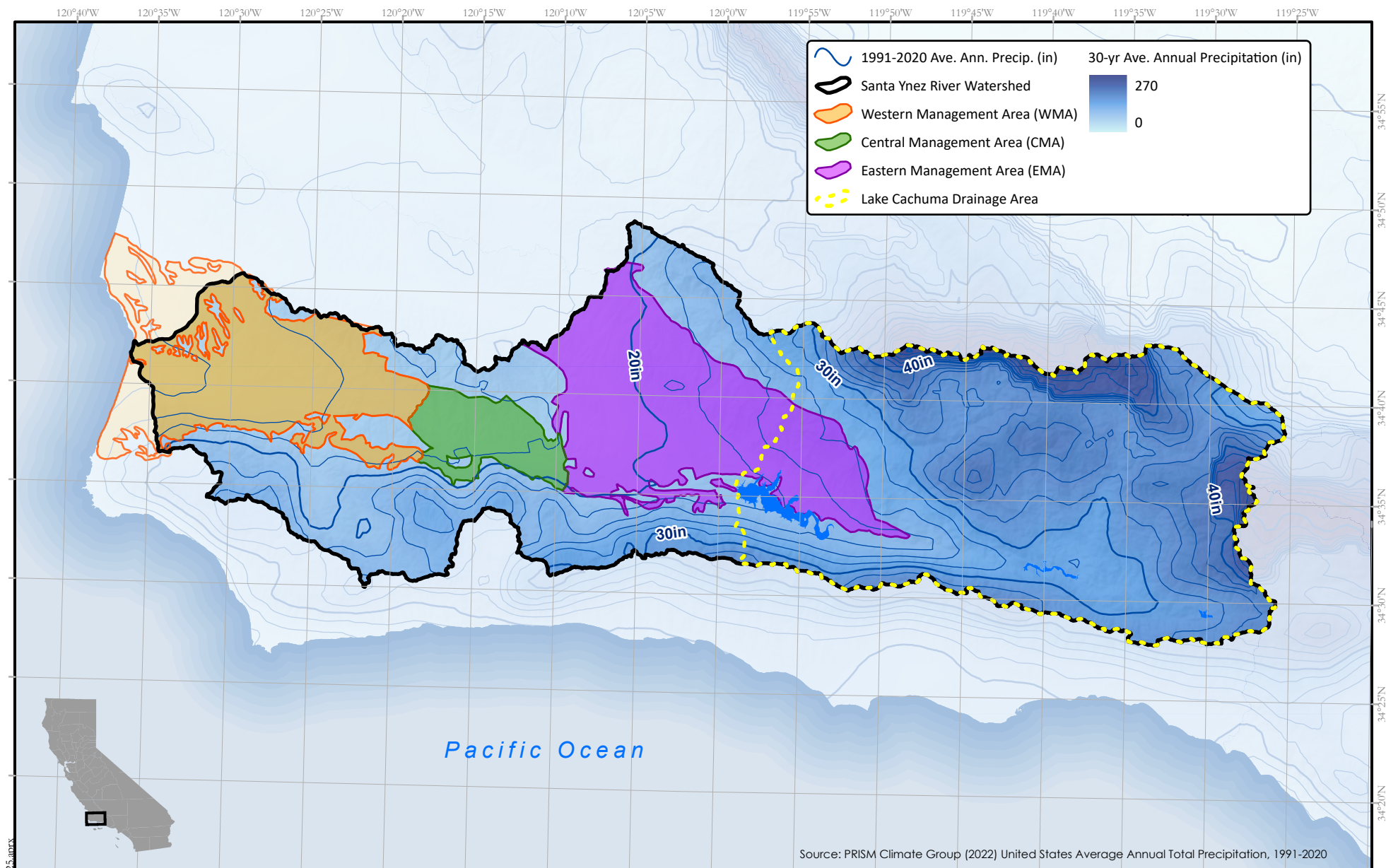


FIGURE 1



**PRISM 30 YEAR AVERAGE ANNUAL PRECIPITATION
SANTA YNEZ RIVER AND LAKE CACHUMA
SANTA BARBARA COUNTY**

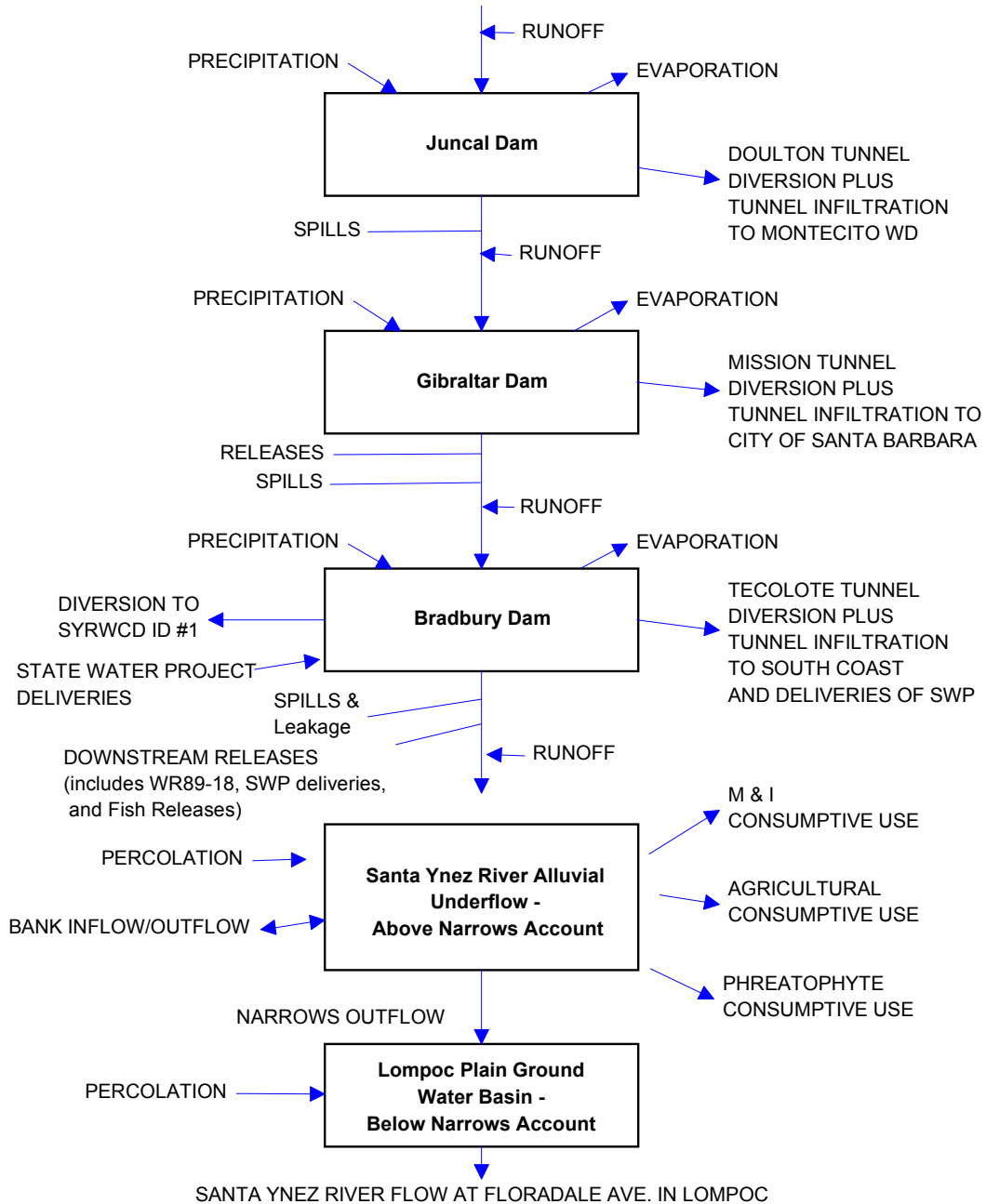
0 3.5 7 Miles

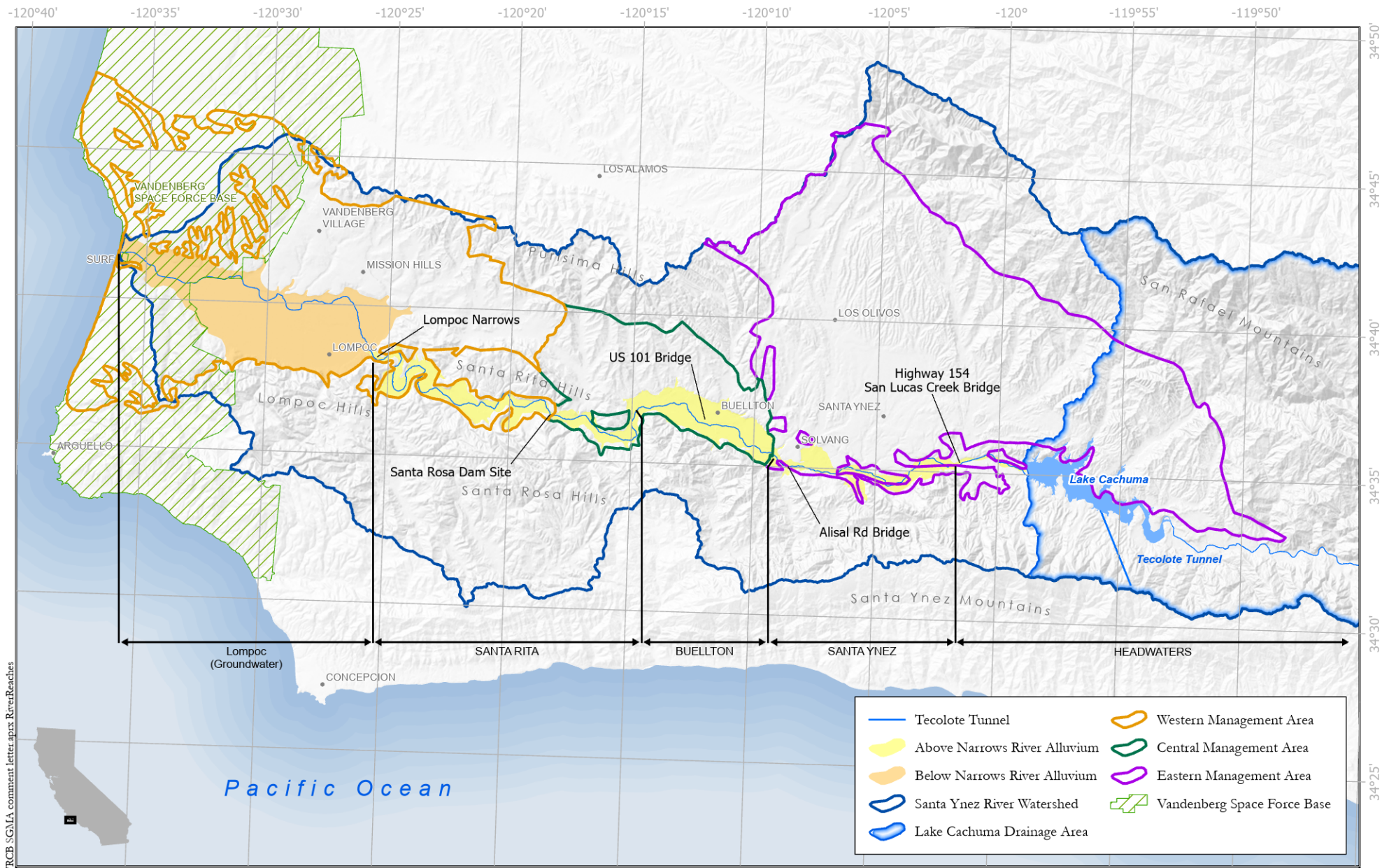


FIGURE 2



SCHEMATIC PRESENTATION OF THE HYDROLOGIC INPUTS AND OUTPUTS FOR THE SANTA YNEZ WATERSHED





REACHES AND ALLUVIUM
LOWER SANTA YNEZ RIVER, SANTA BARBARA COUNTY



Path: I:\11126\April 2023 SWRCB SGMA comment letter.aprx RiverReaches

FIGURE 2

APPENDIX E

Baseline and Current Water Quality Conditions with Respect to
Minimum Thresholds for Representative Water Quality
Monitoring Network

Appendix E. Baseline and Current Water Quality Conditions with Respect to Minimum Thresholds for Representative Water Quality Monitoring Network, mg/L

Well ID	Well Use	Baseline Conditions (2015-2018)						Current Conditions (2019-2024)						Minimum Threshold					
		TDS	Chloride	Sulfate mg/L	Boron	Sodium	Nitrate (as N)	TDS	Chloride	Sulfate mg/L	Boron	Sodium	Nitrate (as N)	TDS	Chloride	Sulfate mg/L	Boron	Sodium	Nitrate (as N)
4200531-010	Public Water System	800	NA	NA	NA	NA	NA	850	NA	NA	NA	NA	NA	800	50	10	0.5	20	10
4200612-006	Public Water System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
4200616-004	Public Water System	NA	NA	NA	NA	NA	NA	815	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
4200800-001	Public Water System	740	NA	300	NA	54	8	795	NA	325	NA	52	7	740	50	300	0.5	54	10
4200802-001	Public Water System	410	50	8.7	0.1	39	3	390	53	7.5	0.1	36	2	600	50	10	0.5	39	10
4200802-002	Public Water System	NA	45	9.4	0.1	35	5	NA	47	9.4	0.1	35	2	600	50	10	0.5	35	10
4200804-006	Public Water System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	600	50	10	0.5	20	10
4200804-008	Public Water System	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	NA	3	600	50	10	0.5	20	10
4200807-006	Public Water System	400	40	11	0.1	29	3	NA	NA	NA	NA	NA	3	600	50	11	0.5	29	10
4200807-009	Public Water System	NA	NA	NA	NA	NA	NA	400	39	20	0.2	52	2	600	50	10	0.5	20	10
4200837-003	Public Water System	380	53	19	NA	42	5	460	48	52	NA	62	2	600	53	19	0.5	42	10
4200837-004	Public Water System	460	40	66	NA	70	1	480	52	69	NA	84	1	600	50	66	0.5	70	10
4200881-002	Public Water System	NA	NA	NA	NA	NA	3	450	32	51	0.2	88	2	600	50	10	0.5	20	10
4200881-005	Public Water System	NA	NA	NA	NA	NA	NA	390	44	14	0.2	39	NA	600	50	10	0.5	20	10
4200893-002	Public Water System	NA	NA	NA	NA	NA	3	NA	NA	NA	NA	NA	3	600	50	10	0.5	20	10
4200893-003	Public Water System	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	32	2	600	50	10	0.5	20	10
4200895-001	Public Water System	NA	NA	NA	NA	NA	3	NA	NA	NA	NA	NA	3	600	50	10	0.5	20	10
4200915-001	Public Water System	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	2	600	50	10	0.5	20	10
4200931-002	Public Water System	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	2	600	50	10	0.5	20	10
4210013-001	Municipal	1065	114	276	0.3	71	4	1045	111	273	0.3	72	3	1065	114	276	0.5	71	10
4210013-006	Municipal	910	86	232	0.2	68	1	910	86	254	0.2	63	1	910	86	232	0.5	68	10
4210013-015	Municipal	760	86	203	0.2	69	2	710	93	141	0.2	56	3	760	86	203	0.5	69	10
4210020-011	Municipal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
4210020-018	Municipal	605	50	140	0.1	42	6	590	59	145	0.1	41	6	605	50	140	0.5	42	10
4210020-027	Municipal	465	49	45	0.1	48	3	465	40	66	0.2	61	1	600	50	45	0.5	48	10
4210020-031	Municipal	550	34	150	0.1	40	2	520	35	145	0.1	37	2	600	50	150	0.5	40	10
AGL020000786-ROBLAR_D/I	Domestic/Agricultural	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
AGL020000888-CLMWC	Agricultural	495	50	14	NA	36	NA	NA	NA	NA	NA	NA	NA	600	50	14	0.5	36	10
AGL020000888-FAITH WELL	Agricultural	405	44	42	NA	37	NA	NA	NA	NA	NA	NA	NA	600	50	42	0.5	37	10
AGL020001203-BW DOM	Domestic	570	47	138	NA	36	NA	NA	NA	NA	NA	NA	NA	600	50	138	0.5	36	10
AGL020001203-WELL BW1	Agricultural	440	52	65	NA	31	NA	486	NA	NA	NA	NA	NA	600	52	65	0.5	31	10
AGL020002508-WELL	Agricultural	666	91	129	NA	70	NA	NA	NA	NA	NA	NA	NA	666	91	129	0.5	70	10
AGL020003217-J BLOCK	Agricultural	530	39	174	NA	33	NA	544	NA	NA	NA	NA	NA	600	50	174	0.5	33	10
AGL020003217-WINERY	Agricultural	520	46	165	NA	34	NA	526	NA	NA	NA	NA	NA	600	50	165	0.5	34	10
AGL020003217-XRDS	Agricultural	625	24	205	NA	35	NA	NA	NA	NA	NA	NA	NA	625	50	205	0.5	35	10
AGL020003684-TIERRA ALTA AG	Agricultural	580	51	131	NA	69	NA	538	NA	NA	NA	NA	NA	600	51	131	0.5	69	10
AGL020003684-TIERRA ALTA DOM	Domestic	565	51	128	NA	68	NA	NA	NA	NA	NA	NA	NA	600	51	128	0.5	68	10
AGL020003688-FOX AG/DOMESTIC	Domestic/Agricultural	460	46	71	NA	72	NA	430	NA	NA	NA	NA	2	600	50	71	0.5	72	10
AGL020003701-STAG CANYON DOM	Domestic	370	49	12	NA	31	NA	395	NA	NA	NA	NA	3	600	50	12	0.5	31	10
AGL020004012-ESTELLE 8 & 9	Agricultural	465	39	23	NA	25	NA	438	NA	NA	NA	NA	NA	600	50	23	0.5	25	10
AGL020004012-ESTELLE VINEYAR	Agricultural	395	38	14	NA	21	NA	NA	NA	NA	NA	NA	NA	600	50	14	0.5	21	10
AGL020004744-PRIMARY	Agricultural	630	35	191	NA	NA	6	756	NA	NA	NA	NA	NA	630	50	191	0.5	20	10
AGL020006120-COGVIN_D/I	Domestic/Agricultural	NA	NA	NA	NA	NA	NA	769	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
AGL020007172-VINEYARD WELL	Agricultural	680	63	154	NA	38	NA	698	NA	NA	NA	NA	NA	680	63	154	0.5	38	10
AGL020007556-WDVINEYARD	Agricultural	486	46	25	0.0	27	2	478	46	25	NA	24	NA	600	50	25	0.5	27	10
AGL020007594-MIDDLE WELL	Agricultural	625	48	148	NA	157	NA	NA	NA	NA	NA	NA	NA	625	50	148	0.5	157	10
AGL020012024-CAMP4_DOM	Domestic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
AGL020012024-CAMP4_IRR	Agricultural	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
AGL020012024-CMP4NEW_I	Agricultural	450	69	20	NA	24	NA	426	NA	NA	NA	NA	NA	600	69	20	0.5	24	10
AGL020014886-SANGER RANCH A	Domestic	495	37	29	NA	29	NA	494	NA	NA	NA	NA	NA	600	50	29	0.5	29	10
AGL020023842-COGC_0520	Agricultural	NA	NA	NA	NA	NA	NA	611	NA	NA	NA	NA	NA	600	50	10	0.5	20	10
AGL020027368-WELL	Agricultural	805	92	200	NA	40	NA	NA	NA	NA	NA	NA	NA	805	92	200	0.5	40	10
AGL020027634-EDISON WELL	Agricultural	505	46	104	NA	34	NA	700	49	138	NA	35	NA	600	50	104	0.5	34	10
AGL020027634-IRRIGATION WELL	Agricultural	600	47	148	NA	35	NA	500	54	87	NA	35	NA	600	50	148	0.5	35	10
AGL020027994-SV#1	Agricultural	340	29	6.1	NA	23	NA	384	NA	NA	NA	NA	NA	600	50	10	0.5	23	10
AGL020027994-SV#2	Agricultural	410	39	51	NA	76	NA	NA	NA	NA	NA	NA	NA	600	50	51	0.5	76	10
AGL020028004-AG WELL 1	Agricultural	395	40	25	NA	30	3	NA	NA	NA	NA	NA	NA	600	50	25	0.5	30	10
AGL020028294-PEGASUS DOM	Domestic	650	45	174	NA	45	NA	NA	NA	NA	NA	NA	NA	650	50	174	0.5	45	10
AGL020028294-PEGASUS IRR	Agricultural	635	44	173	NA	45	NA	NA	NA	NA	NA	NA	NA	635	50	173	0.5	45	10
AGL020028389-VINE WELL	Agricultural	490	52	29	NA	30	NA	432	NA	NA	NA	NA	NA	600	52	29	0.5	30	10
AGL020028425-RODNEYSVD	Domestic	415	26	140	NA	39	ND	480	NA	NA	NA	NA	NA	600	50	140	0.5	39	10
Average		553	51	104	0.1	46	3	569	56	107	0.2	50	3						

Notes

All values are averages over all available data from GAMA and SDWIS data bases on per well basis. The water quality monitoring network within the EMA includes 26 municipal wells (monitored by the SWRCB DDW program) and 35 agricultural and domestic wells (monitored by the SWRCB ILRP) within principal aquifers that have been regularly sampled since at least 2015 for groundwater quality. Baseline conditions consider water quality samples from January 1st, 2015 through December 31st, 2018. Current conditions consider samples from January 1st, 2019 through December 31st, 2024.

All values are reported in milligrams per liter (mg/L).

Bolded Red Values indicate the current condition value exceeds minimum threshold.

NA = Not Available

APPENDIX F

Proposed Minimum Thresholds for Representative Water Quality Monitoring Network

Appendix F. Proposed Minimum Thresholds for Representative Water Quality Monitoring Network Wells

Well ID	Well Use	Proposed Minimum Thresholds (mg/L)				
		Chloride	Sulfate	Boron	Sodium	Nitrate (as N)
4200531-010	Public Water System	150	700	0.5	100	10
4200612-006	Public Water System	150	700	0.5	100	10
4200616-004	Public Water System	150	700	0.5	100	10
4200800-001	Public Water System	150	700	0.5	100	10
4200802-001	Public Water System	150	700	0.5	100	10
4200802-002	Public Water System	150	700	0.5	100	10
4200804-006	Public Water System	150	700	0.5	100	10
4200804-008	Public Water System	150	700	0.5	100	10
4200807-006	Public Water System	150	700	0.5	100	10
4200807-009	Public Water System	150	700	0.5	100	10
4200837-003	Public Water System	150	700	0.5	100	10
4200837-004	Public Water System	150	700	0.5	100	10
4200881-002	Public Water System	150	700	0.5	100	10
4200881-005	Public Water System	150	700	0.5	100	10
4200893-002	Public Water System	150	700	0.5	100	10
4200893-003	Public Water System	150	700	0.5	100	10
4200895-001	Public Water System	150	700	0.5	100	10
4200915-001	Public Water System	150	700	0.5	100	10
4200931-002	Public Water System	150	700	0.5	100	10
4210013-001	Municipal	150	700	0.5	100	10
4210013-006	Municipal	150	700	0.5	100	10
4210013-015	Municipal	150	700	0.5	100	10
4210020-011	Municipal	150	700	0.5	100	10
4210020-018	Municipal	150	700	0.5	100	10
4210020-027	Municipal	150	700	0.5	100	10
4210020-031	Municipal	150	700	0.5	100	10
AGL020000786-ROBLAR_D/I	Domestic/Agricultural	150	700	0.5	100	10
AGL020000888-CLMWC	Agricultural	150	700	0.5	100	10
AGL020000888-FAITH WELL	Agricultural	150	700	0.5	100	10
AGL020001203-BW DOM	Domestic	150	700	0.5	100	10
AGL020001203-WELL BW1	Agricultural	150	700	0.5	100	10
AGL020002508-WELL	Agricultural	150	700	0.5	100	10
AGL020003217-J BLOCK	Agricultural	150	700	0.5	100	10
AGL020003217-WINERY	Agricultural	150	700	0.5	100	10
AGL020003217-XRDS	Agricultural	150	700	0.5	100	10
AGL020003684-TIERRA ALTA AG	Agricultural	150	700	0.5	100	10
AGL020003684-TIERRA ALTA DOM	Domestic	150	700	0.5	100	10
AGL020003688-FOX AG/ DOMESTIC	Domestic/Agricultural	150	700	0.5	100	10
AGL020003701-STAG CANYON DOM	Domestic	150	700	0.5	100	10
AGL020004012-ESTELLE 8 & 9	Agricultural	150	700	0.5	100	10
AGL020004012-ESTELLE VINEYAR	Agricultural	150	700	0.5	100	10
AGL020004744-PRIMARY	Agricultural	150	700	0.5	100	10
AGL020006120-COGVIN_D/I	Domestic/Agricultural	150	700	0.5	100	10
AGL020007172-VINEYARD WELL	Agricultural	150	700	0.5	100	10
AGL020007556-WDVINEYARD	Agricultural	150	700	0.5	100	10
AGL020007594-MIDDLE WELL	Agricultural	150	700	0.5	157	10
AGL020012024-CAMP4_DOM	Domestic	150	700	0.5	100	10
AGL020012024-CAMP4_IRR	Agricultural	150	700	0.5	100	10
AGL020012024-CMP4NEW_I	Agricultural	150	700	0.5	100	10
AGL020014886-SANGER RANCH A	Domestic	150	700	0.5	100	10
AGL020023842-CCGC_0520	Agricultural	150	700	0.5	100	10
AGL020027368-WELL	Agricultural	150	700	0.5	100	10
AGL020027634-EDISON WELL	Agricultural	150	700	0.5	100	10
AGL020027634-IRRIGATION WELL	Agricultural	150	700	0.5	100	10
AGL020027994-SYV#1	Agricultural	150	700	0.5	100	10
AGL020027994-SYV#2	Agricultural	150	700	0.5	100	10
AGL020028004-AG WELL 1	Agricultural	150	700	0.5	100	10
AGL020028294-PEGASUS DOM	Domestic	150	700	0.5	100	10
AGL020028294-PEGASUS IRR	Agricultural	150	700	0.5	100	10
AGL020028389-VINE WELL	Agricultural	150	700	0.5	100	10
AGL020028425-RODNEYSVYD	Domestic	150	700	0.5	100	10

Note

All values are reported in milligrams per liter (mg/L).

Bolded values indicate MT is based on 120% of baseline concentration. Baseline concentrations on a well-by-well basis are listed in Appendix D.

APPENDIX G

hydroGEOPHYSICS, Inc. 2020 Geophysical Investigation

RPT-2020-028

**GEOPHYSICAL INVESTIGATION OF
THE SANTA YNEZ RIVER
GROUNDWATER BASIN - CALIFORNIA**

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

This report documents results from a P-wave refraction survey in the Santa Ynez River groundwater basin near the towns of Santa Ynez and Solvang, California. The objective of the geophysical survey was to investigate the thickness of alluvial deposits and depth to bedrock across the Santa Ynez Valley, California.

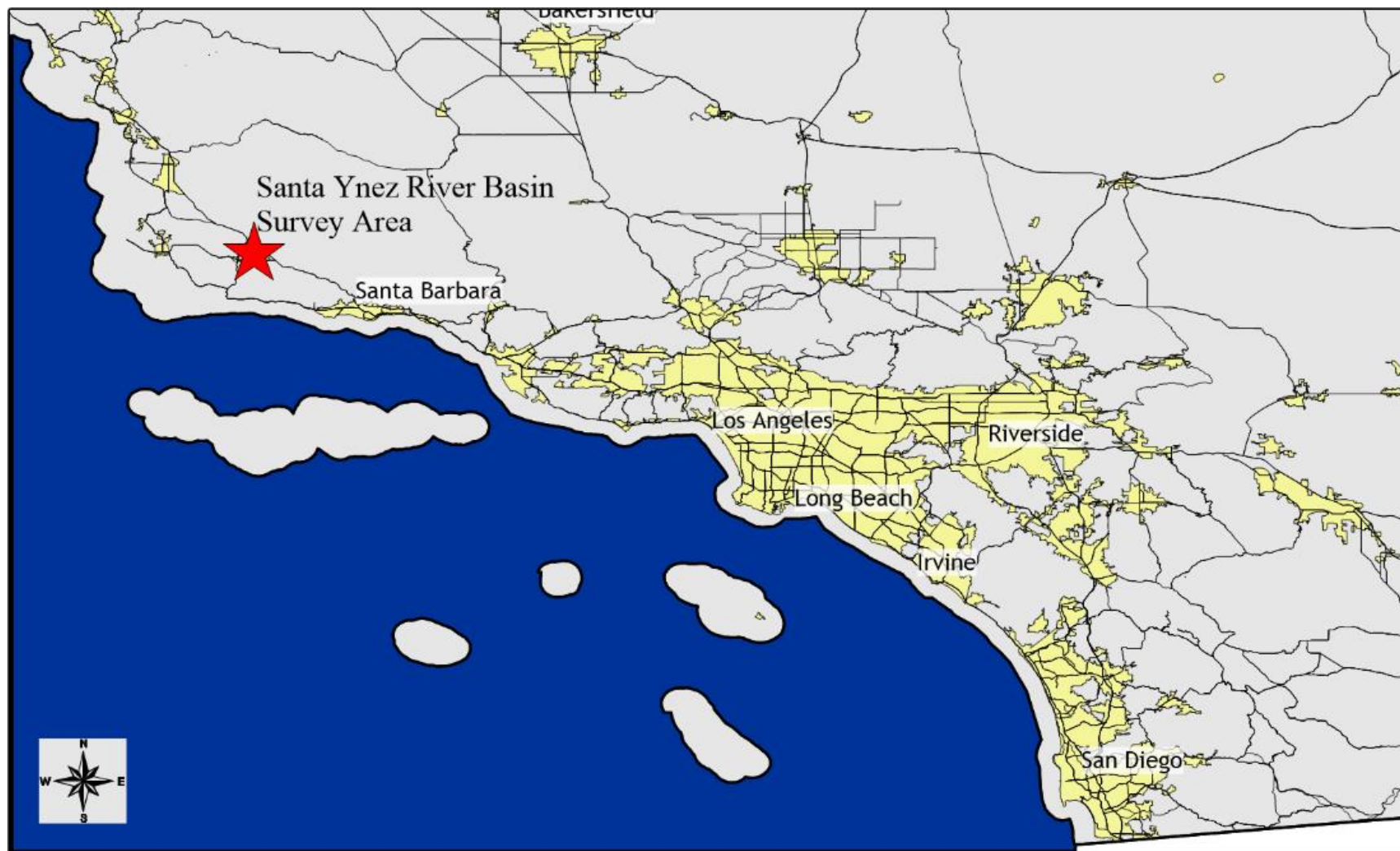
hydroGEOPHYSICS, Inc. (HGI) collected P-wave refraction data from July 28th through August 7th, 2020. The P-wave refraction method is well suited to determining depth to bedrock and bedrock structure, based on the anticipated contrast in seismic velocity between unconsolidated alluvial and bedrock materials. Due to the dependence of seismic velocity on the elasticity and density of the material through which the energy is passing, seismic refraction surveys provide a measure of material strengths and can consequently be used as an aid in assessing rippability and rock quality.

1.2 SITE LOCATION

The survey site is in southern California, north of the city of Santa Barbara near the Los Angeles Basin. Figure 1 shows the general location of the survey area.

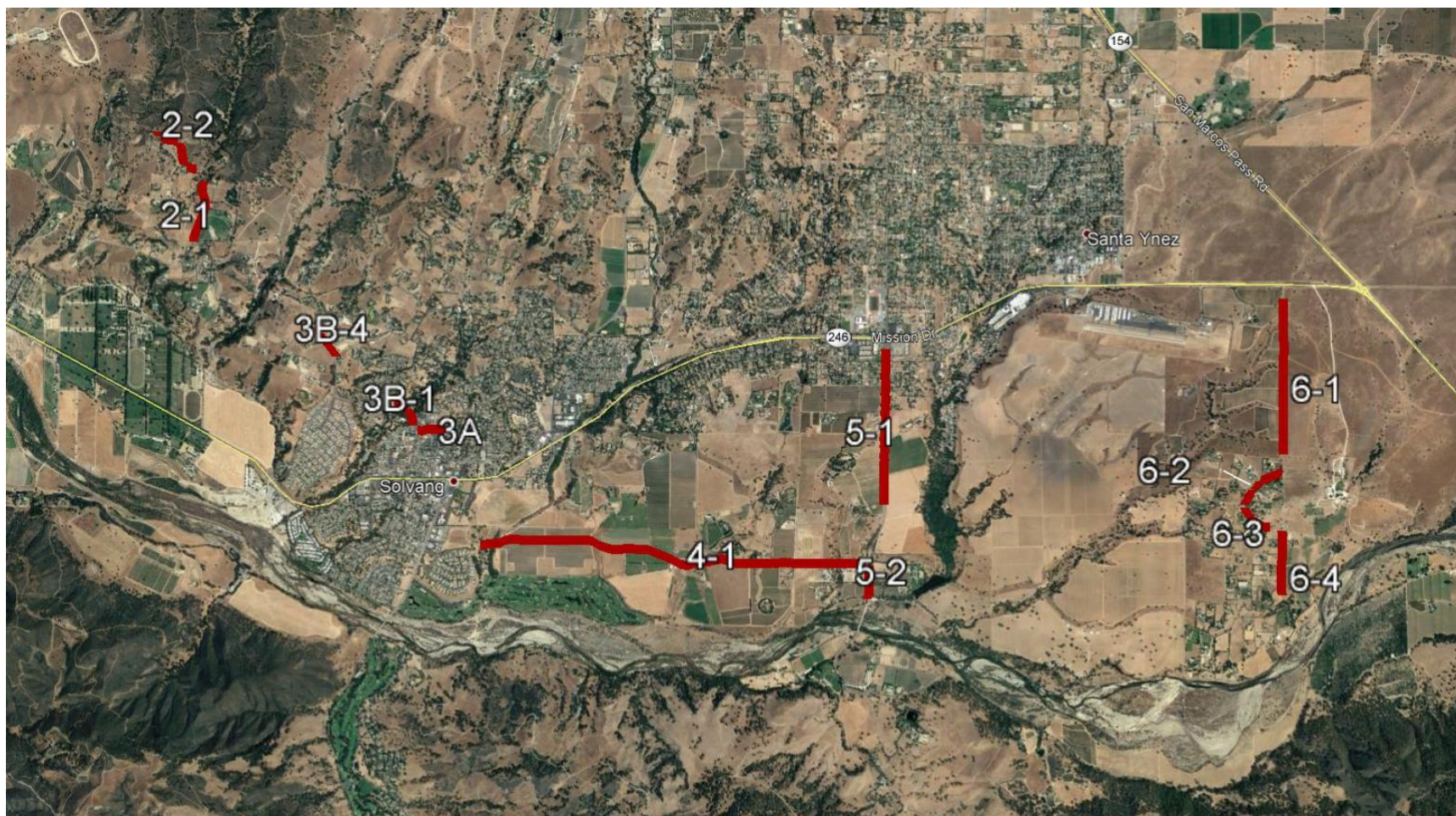
The P-wave refraction survey lines were predominately collected along roadways near the towns of Santa Ynez and Solvang, California. Figure 2 displays an overview of the region, with the P-wave refraction survey lines highlighted by the red lines. The Santa Ynez River trends east-west through the valley, with Santa Ynez mountains to the south of the river, and rolling hills and alluvial basins to the north of the river. Agriculture, ranches, and vineyards, outside of the small urban areas of Solvang, Santa Ynez, and Buellton, California, dominate land use in the region.

Figure 1. General Location Map of the Santa Ynez River Basin Study Area, CA.



*GIS layers from US Census Tiger data, 2019

Figure 2. Aerial Photograph of the Santa Ynez Valley with Geophysical Survey Layout Overlaid (red lines).



*Image from Google Earth™, 2020. Image date 8/2018

2.0 BACKGROUND

2.1 GEOLOGY OF THE SANTA YNEZ GROUNDWATER BASIN

The survey area lies within the Santa Ynez Basin, a fault bounded basin in the Coast Range of California that is situated between the folded and faulted Santa Ynez Mountains to the south, and the folded and faulted San Rafael Mountains to the north. The basin itself shows broad folding in the form of syn- and anticlines with west to northwest trending axes.

The development of the Santa Ynez basin began in the Eocene with the marine deposition of muds, sands and gravels that became the Tejon Formation and Monterey Shale. Ongoing deformation raised the basin, as recorded by the shallow marine deposits of the Sisquoc Formation, and by the end of the Pliocene the marine environment had given way to predominately continental deposition of the Careaga sands and later the 3,000-foot-thick Paso Robles Formation. In the early to mid-Pleistocene, continued crustal deformation led to the rise of the San Rafael and Santa Ynez Mountains, and the shedding of alluvial fan material into the basin with concurrent folding of the existing deposits created the terrace deposits which dominate the surficial geology of the study area (Upson & Thomasson, 1951).

Figure 2 displays the survey area on the T.W. Diblee geologic maps of the Solvang and Gaviota 24k quadrangles (Diblee, 1988), and Santa Ynez and Tajiguas 24k quadrangles (Diblee, 1988). The current geophysical survey aims at delineating the Pleistocene alluvial terrace deposits (Qoa) from the underlying lithologic units of the Paso Robles Formation (QTp), Careaga Sandstone (Tca), Sisquoc Shale (Tsq), and Monterey Shale (Tm) (abbreviations of geologic units from Diblee, 1988).

Depth to bedrock varies across the field area due to the folding and differential erosion of the underlying sediments. Drilling logs help to delineate the alluvial gravels, sands and clays from the underlying formations. Table 1 summarizes the gravel interface for wells in proximity to the survey lines (well location data provided by GSI Water Solutions as georeferenced links to the California Department of Water Resources (CADWR) on-line database). The ‘Figure ID’ references the wells in later figures with the CADWR identifier or Solvang municipal well. The drilling logs from the wells indicate the gravels range in thickness from 30 to nearly 200 feet. The summary table shows approximate distances along the line, and distance and direction from the line for reference and interpretation in the seismic results. Gravel intervals are taken from drilling notes, which do not necessarily denote the change in lithotype from alluvial terrace gravel to

underlying rock units. Water levels are listed where noted in the drilling logs, but span 70 years of drilling records, so likely do not accurately represent the current water table.

Figure 3. Geologic Map of the Santa Ynez Valley (from Dibblee, 1988).

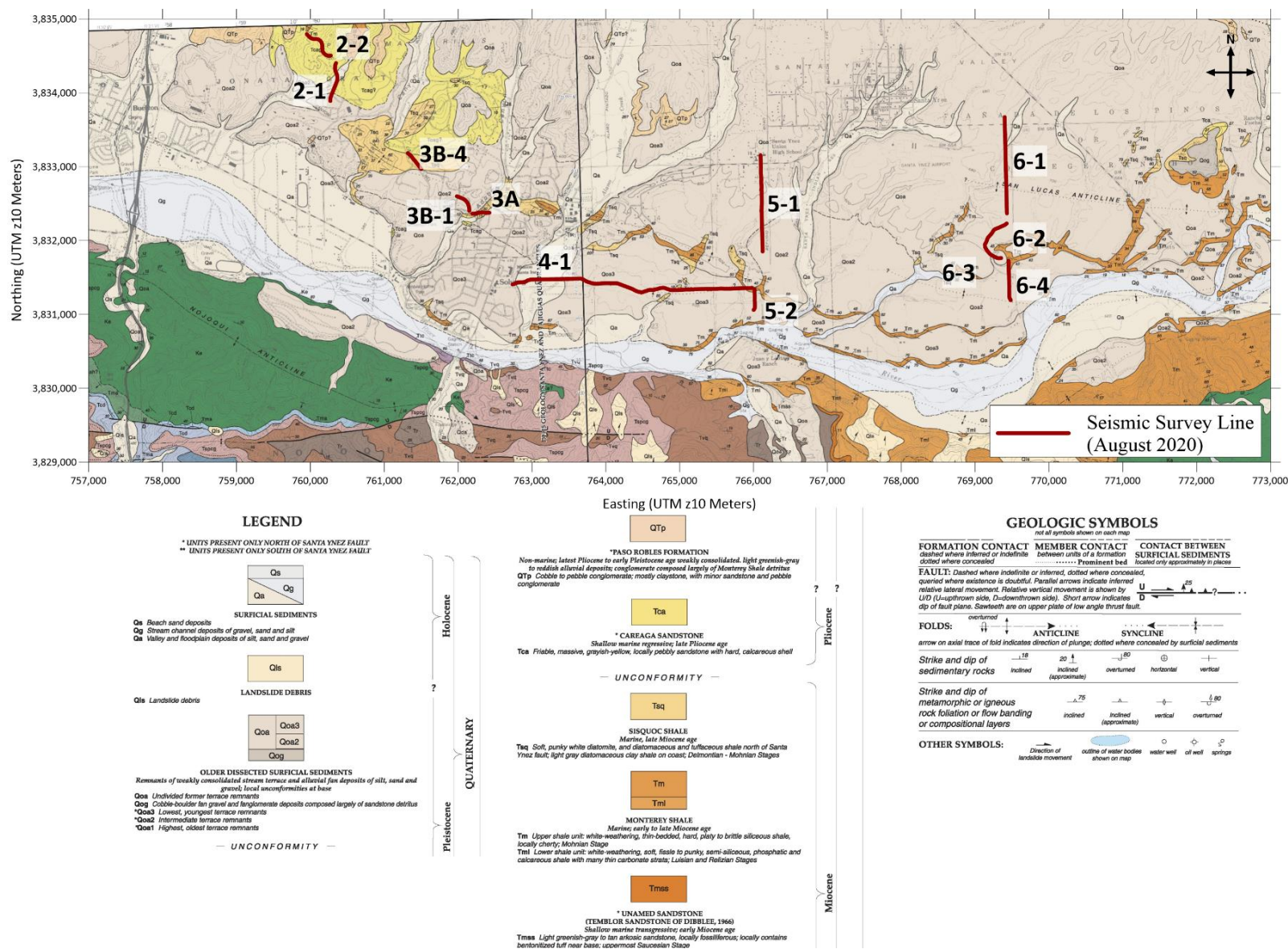


Table 1. Summary of Well Data from CADWR Records.

Figure ID	Line Segment	Well (WCR#)	Line distance	Distance from Line	Direction	Surface Elevation	Gravel Interval	Lithology notes	Water Level (feet bgs)*
Line 2									
CA-1	2-1	WCR0201046	-300	360	SW	525	0-82	0-82: Sand, gravel, clay. 82-472: clay & sand. 472-500: Shale.	144
CA-2	2-1	WCR1980-008896	54	30	W	510		Coordinates inaccurate relative to map in database, should be closer to intersection of Chalk Hill road with Ballard Canyon, approx 2000 east of current projection	
CA-3	2-1	WCR1984-007885	340	405	W	528	0-22, 89-115	0-22: Sand, gravel, clay. 22-89: Sand, clay. 89-115: Coarse sand and gravel. 115-202: Clay, sand, gravel. 202-236: blue clay w/ sand, gravel. 236-336: Shale.	110
CA-4	2-1	WCR0302240	685	625	E	550	0-100?	0-100: Sand, minor clay & gravel. 100-250: Sand & clay. 250-310: Sand - Careaga Frm.	181
CA-5	2-1	WCR1984-007886	890	290	W	543	0-86	0-86: Sand, gravel, clay. 86-120: Clay	NR
CA-6	2-1	WCR2011-008371	1490	660	W	489	0-70	0-70: Sand & gravel. 70-273: Sand, minor gravel. 282-295: Shale	140
Line 3									
VHW	3A	Vets Hall Well	-500	1000	SE	504	18-57	0-18: Soil & clay. 18-57: Gravel. 57-157: Sands & Seashells (Tca?). 157-200: Monterey Shale	
CA-7	3B-4	WCR2005-016164	-300	1550	SW	471	0-78	0-3: Soil. 3-74: Gravel, clay, sand. 78-86: Clay & sand. 86-150: Shale	NR
CA-8	3B-4	WCR2005-016166	-500	1300	SW	471	0-44	0-4: Soil. 4-44: Gravel & clay. 44-80: Clay	NR
Line 4 (distances measured from west end of line)									
CA-9	4-1	Lot72 East Well	160	175	n	423	0-140	140-200 sand w seashells. 200-260 Shale	73
CA-10	4-1	WCR1954-001843	3210	390	S	436	0-96	Shale at 96'	
CA-11	4-1	WCR0027127	6460	1270	N	514	0-50	50-57, clay. Shale 57 - 215'	
Line 5									

Figure ID	Line Segment	Well (WCR#)	Line distance	Distance from Line	Direction	Surface Elevation	Gravel Interval	Lithology notes	Water Level (feet bgs)*
CA-12	5-1	WCR1956-001472	1050	275	E	583	0-105	Gravels & clay 0-105. Clay w gravel 105-200	81
CA-13	5-1	WCR1956-001471	1690	230	E	594	0-105	Gravels & clay 0-105. Clay w gravel 105-200	81
CA-14	5-1	WCR1955-001874	2020	390	E	554	0-117	Gravel & clay 0-117. Solid clay 117-147	82
CA-15	5-1	WCR1955-001875	3410	360	W	530	0-59	59-73, sand + Sandy clay	47
Line 6									
CA-16	6-1	WCR1995-010616	40	715	E	669	0-197	197-260 - Clay. 260-670 Sand +/- Clay	
CA-17	6-1	WCR2014-007858	700	1200	W	674	0-194	0-194: gravel & clay. 194-360: Brown clay w thin sand and gravel	89
CA-18	6-2	WCR1995-010497	120	520	SE	674	0-30	0-30: gravel & clay. 30-500: Monterey Shale (black and gray)	
CA-19	6-2	WCR1995-010617	260	790	SE	668	0-30	0-6: soil & sandy clay. 6-30 Gravel & sand. 30-400: Monterey Shale	
CA-20	6-4	WCR1776-005237	2020 (+300)	650	E	480	0-57	0-57: soil, sand, gravel, clay. 57-68: brown clay, some gravel	14

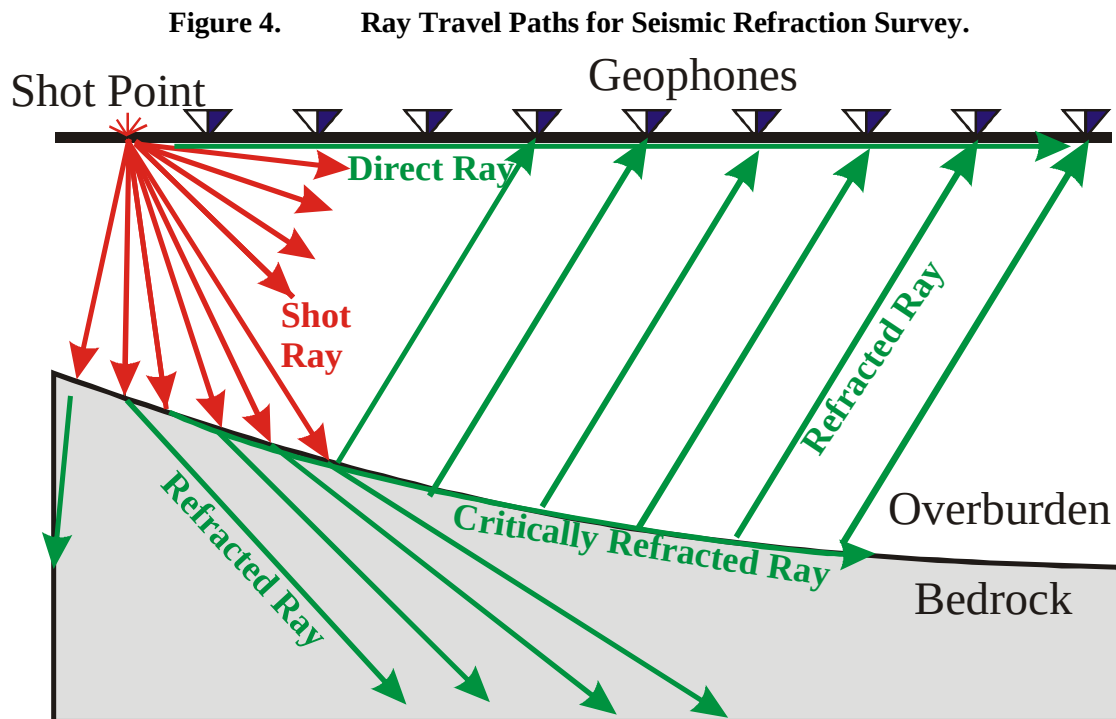
* Water levels are taken from the drilling records and do not likely represent current levels.

3.0 METHODOLOGY

3.1 GEOPHYSICAL METHOD

3.1.1 P-Wave Refraction Method

The P-wave refraction method is based on the measurement of the travel time of seismic waves refracted at the interfaces between subsurface layers of different velocity, which can relate to differing lithologies or degree of weathering for example. Figure 4 shows an example of the seismic refraction method. Seismic energy is provided by a source ('shot') located on the surface. For shallow applications, the shot normally comprises a hammer and plate, weight drop, or small explosive charge (blank shotgun cartridge). Energy radiates out from the shot point, either traveling directly through the upper layer (direct arrivals), or traveling down to and then laterally along higher velocity layers (refracted arrivals) before returning to the surface. The refracted energy is detected on the surface using a linear array (or spread) of geophones spaced at regular intervals. Beyond a certain distance from the shot point, known as the cross-over distance, the refracted signal is observed as a first-arrival signal at the geophones (arriving before the direct arrival). Observation of the travel times of the direct and refracted signals provides information on the depth profile of the refractor.



Data are recorded on a seismograph and later downloaded to a computer for analysis of the first-arrival times to the geophones from each shot position. Travel-time versus distance graphs are then constructed and velocities calculated for the overburden and refractor layers through analysis of the direct arrival and T-minus graph gradients. Depth profiles for each refractor are produced by an analytical procedure based on consideration of shot and receiver geometry and the measured travel-times and calculated velocities. The final output comprises a depth profile of the refractor layer and a velocity model of the subsurface.

The primary applications of seismic refraction are for determining depth to bedrock and bedrock structure. Due to the dependence of seismic velocity on the elasticity and density of the material through which the energy is passing, seismic refraction surveys provide a measure of material strengths and can consequently be used as an aid in assessing rippability and rock quality. The technique has been successfully applied to mapping depth to the base of backfilled quarries, depth of waste materials at landfills, thickness of overburden, voids, and the topography of groundwater.

3.2 GEOPHYSICAL EQUIPMENT

3.2.1 Seismic Equipment

A Geode Ultra-Light Exploration 24-Channel Seismograph (Geometrics Inc., California) was used for the P-wave refraction surveying. The 4.5 Hz geophones were laid out along the survey lines with a constant spacing of approximately 20 feet. The seismic energy source was a 200-pound propelled energy generator (PEG) with an aluminum strike plate.

Shot point spacing was approximately 120 feet, located at the midpoint of geophone positions along the spread, with ‘off-end’ shots varying between 50 to 220 feet beyond the first and last geophones (Table 2). The off-end shot point distance depended on both the calculated cross-over distances from the shot records and local constraints on shot locations. Additional blows forming a new “stack” of data were added until the desired data quality was achieved.

The Geode was controlled from a laptop in order to view each shot record to ensure acceptable data quality. The shot record (seismogram) was also saved to the computer and stored for subsequent processing. A real-time noise monitor showing all geophones was carefully scrutinized during shots to ensure that noise levels were at a minimum for each shot. This included waiting for breaks in wind noise, traffic, aircraft, and other sources of noise. Based on the location of the survey lines along roadways the noise from traffic and other urban activities was significant for many of the line segments. While the majority of the noise could be accounted for in the data collection, the general background noise level was higher than desired which impacted the imaging depth of the method in the affected sections of the survey lines.

4.0 DATA PROCESSING

4.1 QUALITY CONTROL – ONSITE

Data were given a preliminary assessment for quality control (QC) in the field to assure quality of data before progressing the survey. Following onsite QC, the data were transferred to the HGI server for storage and detailed data processing and analysis.

4.2 P-WAVE REFRACTION PROCESSING

Data processing for the seismic refraction method consisted primarily of accounting for energy source and geophone locations, and determining the first arrival times at the geophones. The final step was to determine subsurface acoustic properties using the tomographic inversion method. The software incorporated all of the features necessary for accurate representation of subsurface properties, including the first break pick, inversion, and plotting.

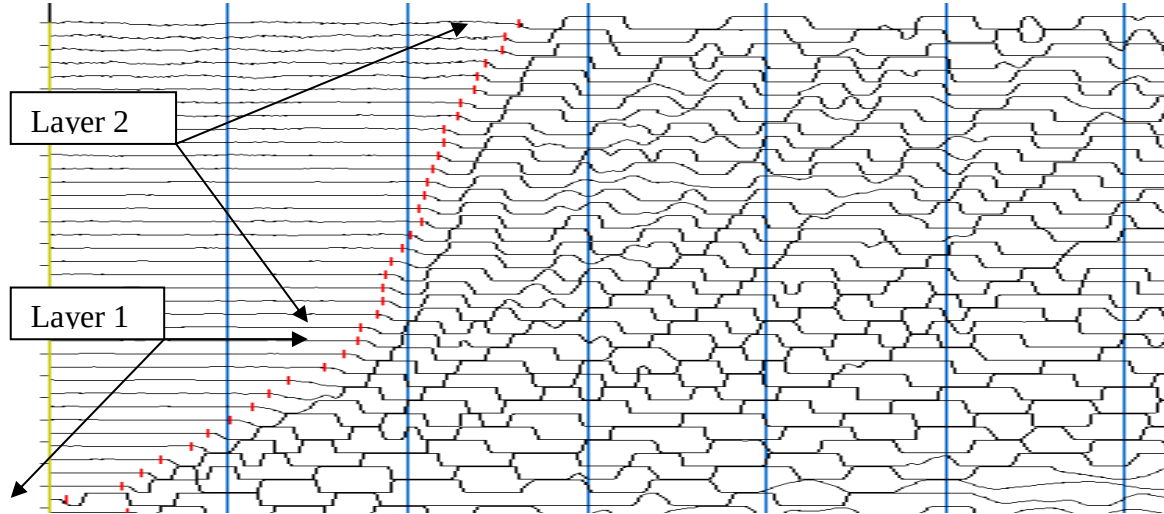
Input Data: Data were reformatted to SEG-Y internal format while preserving trace header information. The geometry was created to define the relationship between the field file and channel numbers, and the source and receiver station numbers. Records marked in the Observer's logs as needing to be omitted were edited from the data.

Geometry & Editing: The data was output as a SEG-Y formatted file for input into the refraction statics program SeisImager (Geometrics, Inc.). At this stage and within the software, edits and corrections were made to account for any errors made in the field.

First Arrival Selection: The first step for data processing was to pick the time for first arrival of energy at the geophone from each of the shot records, also known as first break picking. Each geophone had a separate first break pick for each shot. The first break picking was conducted interactively within the SeisImager's software called Pickwin.

Figure 5 shows an example shot record. The x-axis is time in milliseconds and the y-axis is distance between geophones. The first break picks of energy arriving at the geophones are annotated as red marks below. There is an automatic picking option that is used initially in the software and then each trace in each shot record is manually reviewed and adjusted. There were two distinct velocity slopes in arrivals representing the two layers as illustrated in Figure 5. The first slope, which is much steeper, indicates the slower velocity alluvium layer. The other layer is the refracted energy as it returns from the second and higher velocity layer. The second higher velocity layer was either a more consolidated alluvium or weathered bedrock.

Figure 5. Example Shot Record Showing First Break Picks.



Tomographic Inversion: Tomographic velocity inversion was completed using the SeisImager software. This method starts with an initial velocity model (generated manually or by a time-term inversion and iteratively traces rays through the numerical model) with the goal of minimizing the root-mean squared (RMS) error between the observed and calculated travel times. Tomographic inversion is generally best used when velocity contrasts are known to be more gradational than discrete. In cases where strong horizontal velocity variations are known to exist, and in extreme topography, processing can lead to erroneous results with time-term least squares and delay-time inversion, depending on the severity of variations. Thus, tomographic inversion was chosen for the profiles here. The final output of the inversion modeling is a profile (X and Z dimensions) of acoustic velocity beneath each geophone spread. Generally, tomographic inversion requires a larger quantity and higher quality of data to produce viable results.

4.3 DISCLAIMER

Geophysical data provide objective information about the physical properties of the earth's subsurface. Interpretation of modeled geophysical data is based on site-specific correlation with information from direct observation methods such as drilling, excavation, or construction logs. In the absence of these logs or observations, HGI personnel interpret the data based on experience with similar features and environments. The geophysical methods employed on this project may not detect all subsurface features, such as geologic contacts or hydrogeological features. It is possible that interpreted features may not coincide with the results of invasive sampling, and the depth of investigation may not accurately resolve desired features at depth. In addition, due to modeling procedures, the geophysical results of the inversion process may not represent a unique solution. Reports provide a professional opinion, and therefore no warranty is expressed, implied, or made as to the conclusions, advice or recommendations offered.

5.0 SURVEY AREA

5.1 SEISMIC LINES

Five P-wave refraction survey lines, which were split into multiple segments per survey line to accommodate significant bends in the roadways or other constraints, were collected across the survey area. The survey layout is highlighted in Figure 2 and detailed in Table 1 below. Geophone coordinates were obtained with a survey grade GPS system (Leica GS16) with differential correction of signal, and are reported here in UTM zone 10N meters. Elevations are also from the Leica GS16 system, and are reported in feet above mean sea level (amsl). The total line length is calculated based on a 20-foot separation between geophones, and does not include the distance of the ‘off-end’ shot points. Line segments are highlighted in the following figures and descriptions with select geophones identified, and nearby wells from the CADWR database.

The P-wave refraction survey lines were predominately collected along roadways near the towns of Santa Ynez and Solvang, California, and as such are not always linear or continuous due to logistics and constraints involved in collecting along public and private roadways.

5.2 LINE 2

Line 2 was collected along Viendra Dr. to the northwest of Solvang, California (Figure 6). The survey line comprises two segments, 2-1 and 2-2, and generally trends from south to north along the roadway. Figure 6 shows the detail of the line with both segments. Line segment 2-1 begins at the intersection of Ballard Canyon Rd and Viendra Dr, and continues approximately one-third of a mile north on Viendra Rd. Segment 2-2 begins after the blind hairpin turn and continues to the cul-de-sac at the end of Viendra Rd.

5.3 LINE 3

Line 3 (Figure 7) was collected in three short segments; 3A, 3B-1, and 3B-4. Segment 3A was collected along Eucalyptus Dr, running between Roskilde Rd and through the Solvang School Upper Campus property to Atterdag Rd. Segment 3B-1 was collected along Chalk Hill Rd, from Eucalyptus Dr towards Elsinore Dr. Segment 3B-4 was collected along Chalk Hill Rd. from the corner north of Mesa Dr to the intersection of Mesa Vista Ln. The section between Segments 3B-1 and 3B-4 was omitted from the survey due to safety concerns of working along the roadways in those areas.

5.4 LINE 4

Figure 8 shows the extent of Line 4, which was collected continuously for its entire length of approximately two miles (11,000 feet). The survey line runs east-west across predominately agricultural roads along Mesa Verde and Alisal Mesa Roads, southeast of Solvang, California. The survey line runs perpendicular to Line 5, and the geophone 1 location is coincident with the northern extent of Line 5 segment 5-2.

5.5 LINE 5

Line 5 (Figure 9) runs north to south along Refugio Rd in Santa Ynez, California, and comprises two different segments. Segment 5-1 begins approximately 300 feet south of the intersection of Refugio Rd and US Highway 246, and continues south for three-quarters of a mile (4,300 feet) to the bend in the road north of Mesa Verde Rd. Segment 5-2 begins near the intersection of Refugio Rd with Mesa Verde Rd, and is coincident with the eastern end of Line 4-1.

5.6 LINE 6

Line 6 runs north to south along Meadowlark Rd (Figure 10) to the east of Santa Ynez, California. The line comprises four segments and runs from the intersection of US Highway 246 and Meadowlark Rd to southern extent of Meadowlark Rd where it becomes Indian Way. Meadowlark Rd. makes a broad arc around a hill of apparent bedrock, which was noted by both GSI Water Solutions personnel, and by outcrop of dipping siliciclastic sediments noted in stream bank cuts to the east of the roadway. Segment 6-1 is the northern-most segment and runs from 220 feet south of US Hwy 264 to the sharp southwesterly bend in the road. Segment 6-2 begins at the curve and continues southwest to the western apex of the bedrock arc. Segment 6-3 begins at the western apex of the bedrock arc, and runs to the southeast past White Oak Rd. Segment 6-4 begins where Meadowlark Rd again turns to a straight south road, and continues to the intersection with Indian Way.

Table 2. Summary of Seismic Lines.

Line ID	Segment	Number of Geophones	Geophone Spacing (Feet)	Total Length (Feet)	Collection Direction	Off-End Distance (Feet)	First Geophone			Last Geophone		
							Easting	Northing	Elevation	Easting	Northing	Elevation
2	1	90	20	1,780	S - N	-60	760,270.4	3,833,889.5	511.8	760,347.8	3,834,403.1	529.2
	2	84	20	1,660	SE - NW	-130	760,277.3	3,834,503.8	512.7	759,951.8	3,834,794.7	660.2
3	A	40	20	780	E - W	-85	762,423.7	3,832,376.3	522.0	762,193.4	3,832,363.4	501.7
	B-1	48	20	940	SE - NW	0	762,152.1	3,832,402.9	494.0	761,984.3	3,832,600.0	511.2
	B-4	48	20	940	SE - NW	-61	761,502.0	3,832,967.7	557.7	761,320.0	3,833,183.2	560.5
4	1	546	20	10,900	E - W	-50	765,978.0	3,831,358.2	472.0	762,737.2	3,831,406.5	432.6
5	1	216	20	4,300	N - S	-100	766,094.0	3,833,154.2	604.7	766,122.8	3,831,852.5	527.5
	2	48	20	940	N - S	-100	766,012.1	3,831,340.4	475.4	766,001.0	3,831,061.1	442.7
6	1	216	20	4,300	N - S	-220	769,399.8	3,833,670.3	646.1	769,430.6	3,832,368.4	666.1
	2	73	20	1,440	NE - SW	-60	769,427.7	3,832,231.1	667.8	769,130.2	3,831,941.8	583.2
	3	48	20	940	NW - SE	-80	769,132.9	3,831,916.8	582.9	769,351.4	3,831,763.0	569.2
	4	90	20	1,780	N - S	130	769,451.6	3,831,726.9	575.8	769,482.1	3,831,192.4	524.8

*Coordinates are in UTM Z10, Meters. WGS84 Datum. Elevation in Feet above mean sea level

Figure 6. Survey Line 2 Detail.

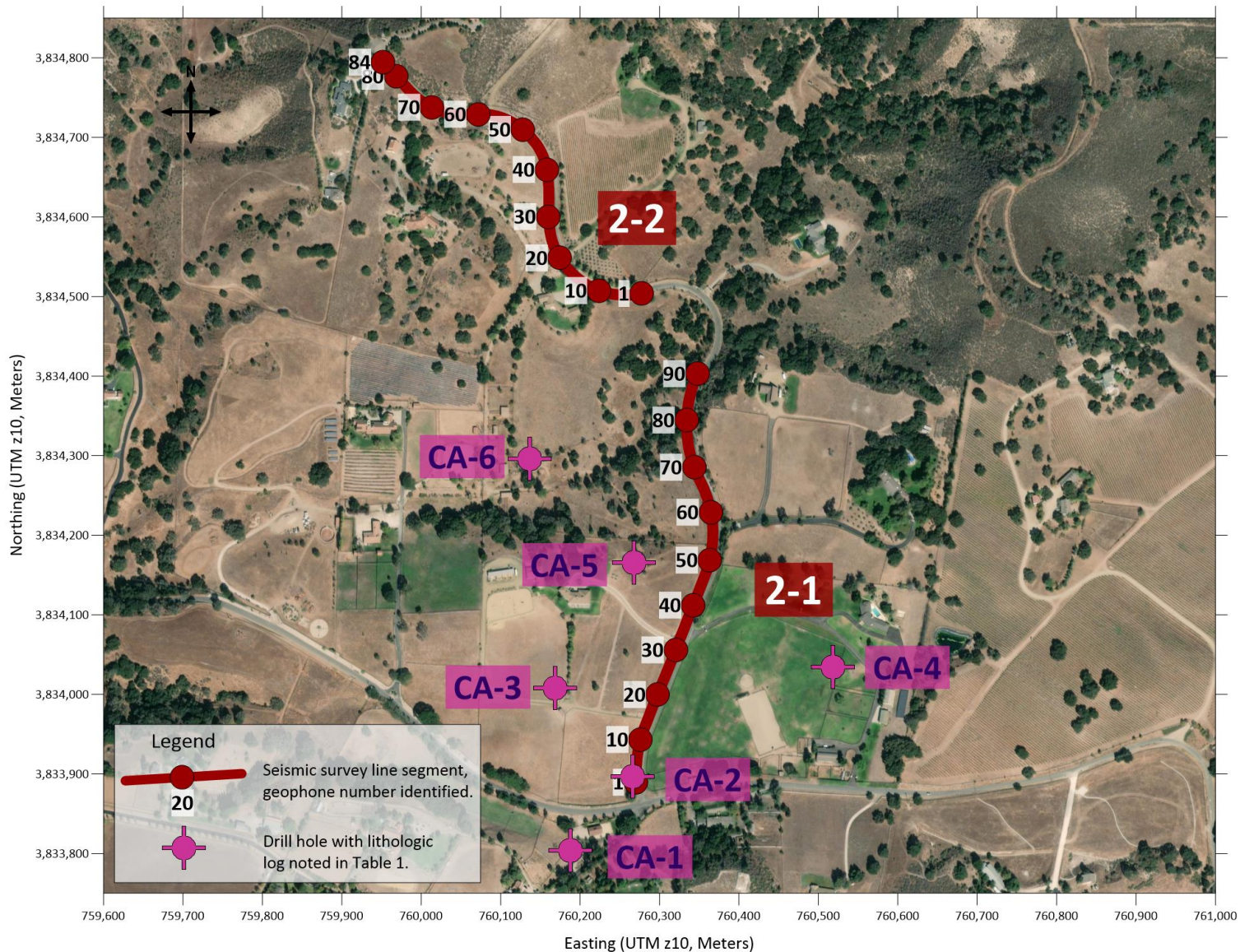


Figure 7. Survey Line 3 Detail.

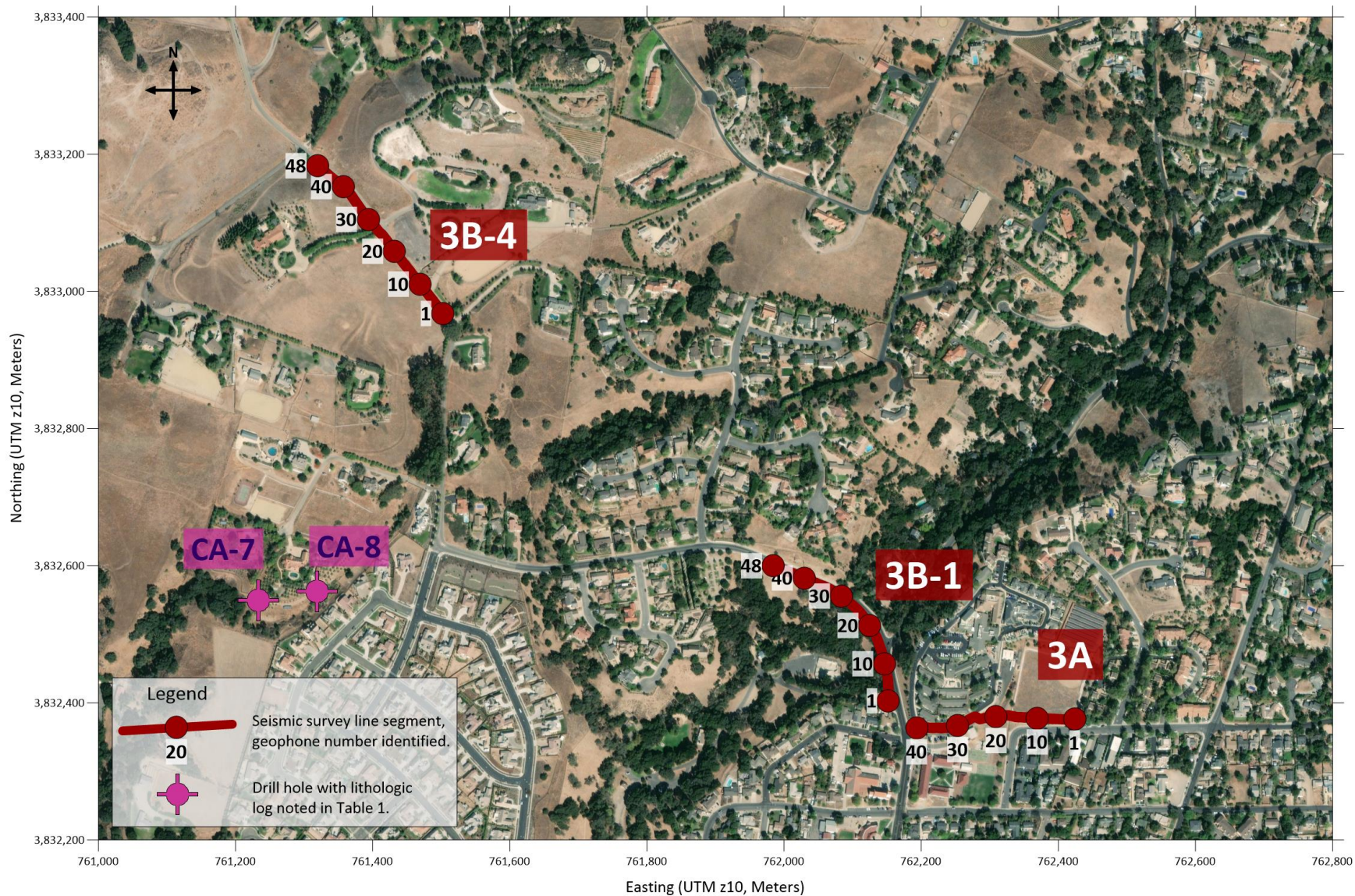


Figure 8. Survey Line 4 Detail.

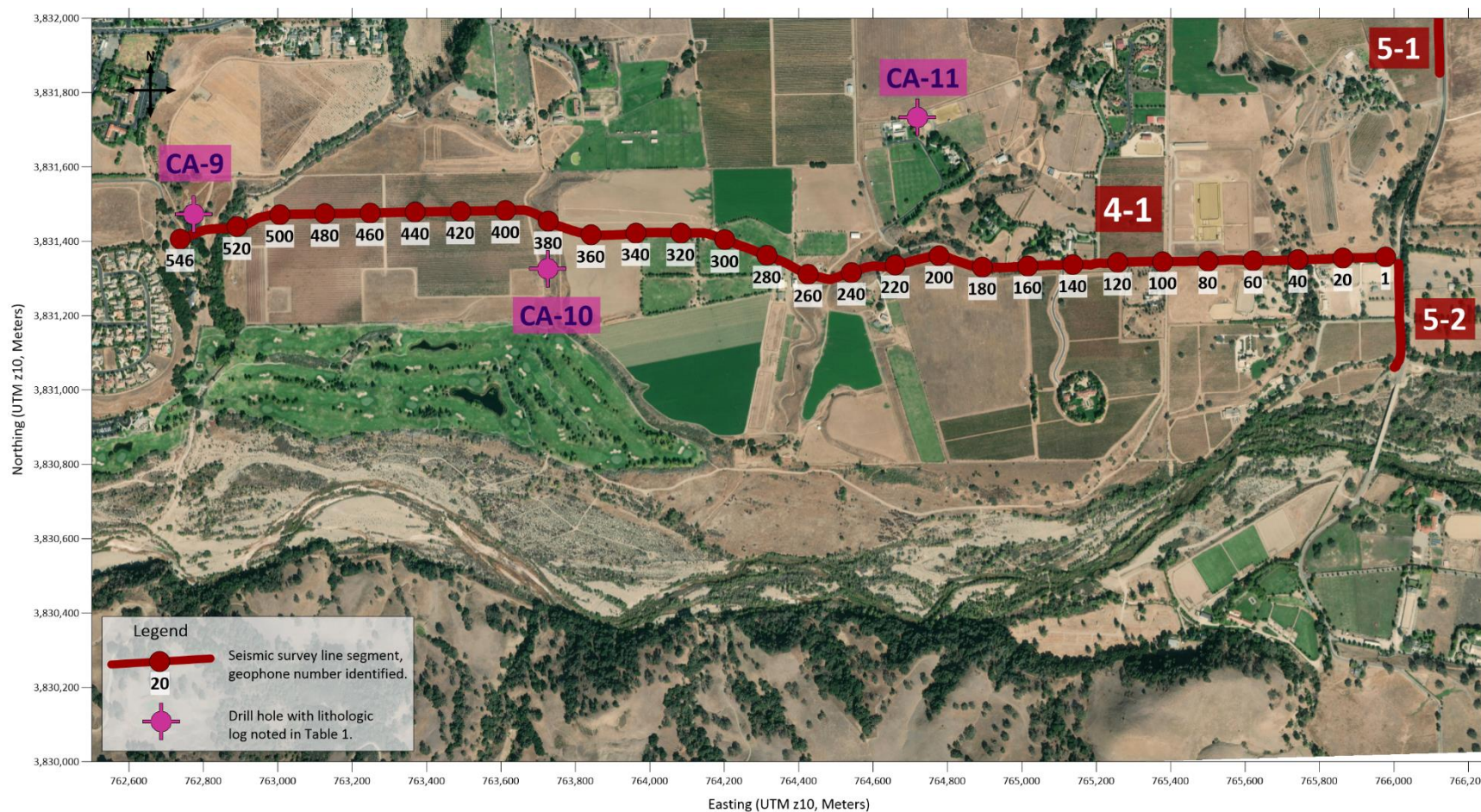


Figure 9. Survey Line 5 Detail.

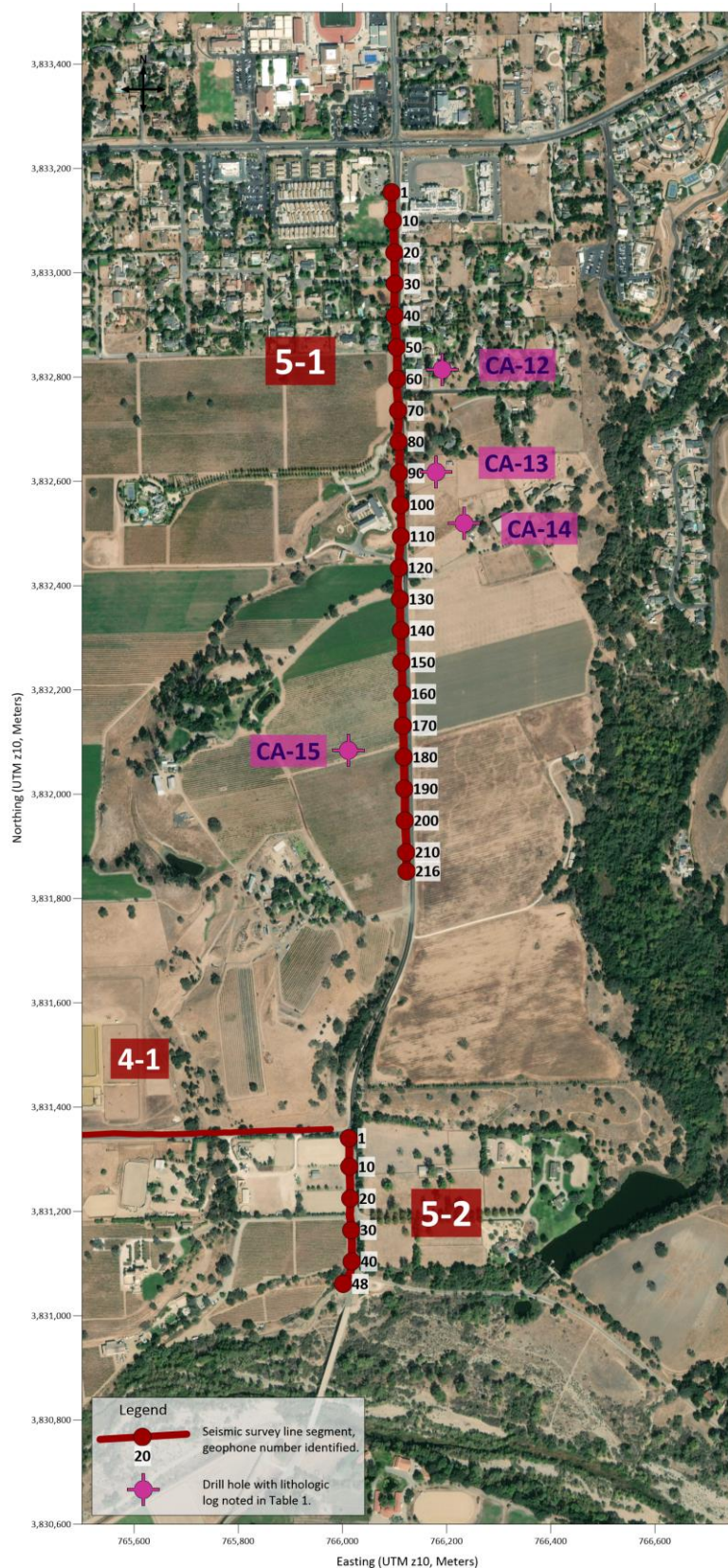
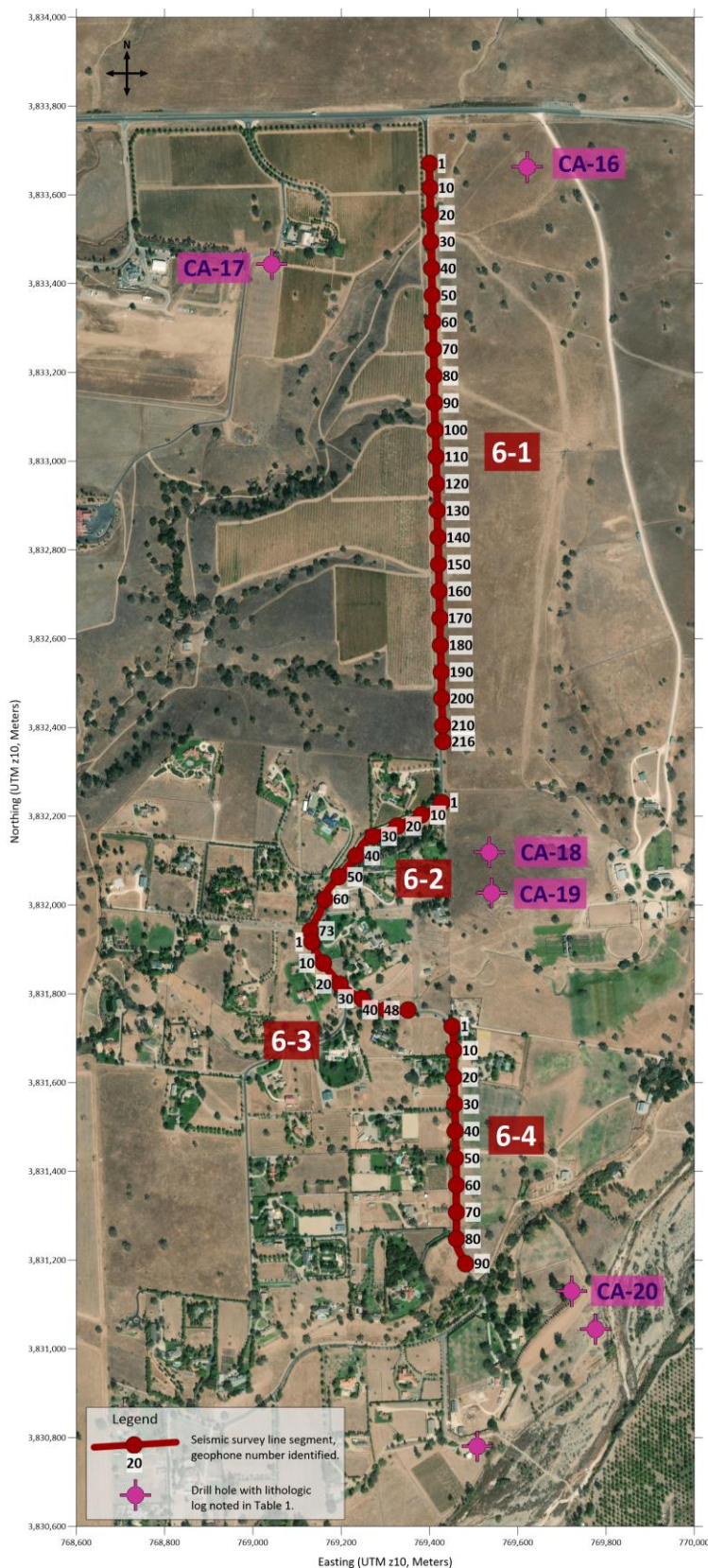


Figure 10. Survey Line 6 Detail.



6.0 RESULTS

6.1 P-WAVE REFRACTION RESULTS

The tomographic inversions for the P-wave refraction profiles are presented in the following section as two-dimensional (2D) cross sections. Multiple segments for each line are displayed in a linear fashion, with elevations translated throughout the figures. Figure 12 displays a summary of all of the survey lines at the same scale, but for the subsequent more detailed figures, each survey line is extended to fit the page, so vertical scales vary from 1:1 to nearly 8:1. The model result profiles account for lateral and vertical variations in seismic velocity and can be useful in identifying subtle changes in the subsurface structure, such as the difference between alluvial material and underlying cemented alluvium and shale. Low seismic velocities are represented by cool shades (purple and blue) and higher seismic velocities as warm shades (yellow and orange). Two versions of the profiles are presented, the top profile represents the tomography model results, noting geophones and the in-line shot points (off end points are not displayed), with the bottom profile overlaying the drilling data (projected onto the section in the majority of cases) and features of note highlighted if warranted. This segregation allows for an objective view of the results and a constrained subjective interpretation of the results. Discussions of each line are provided below, and features of note are located in terms of the approximate line distance.

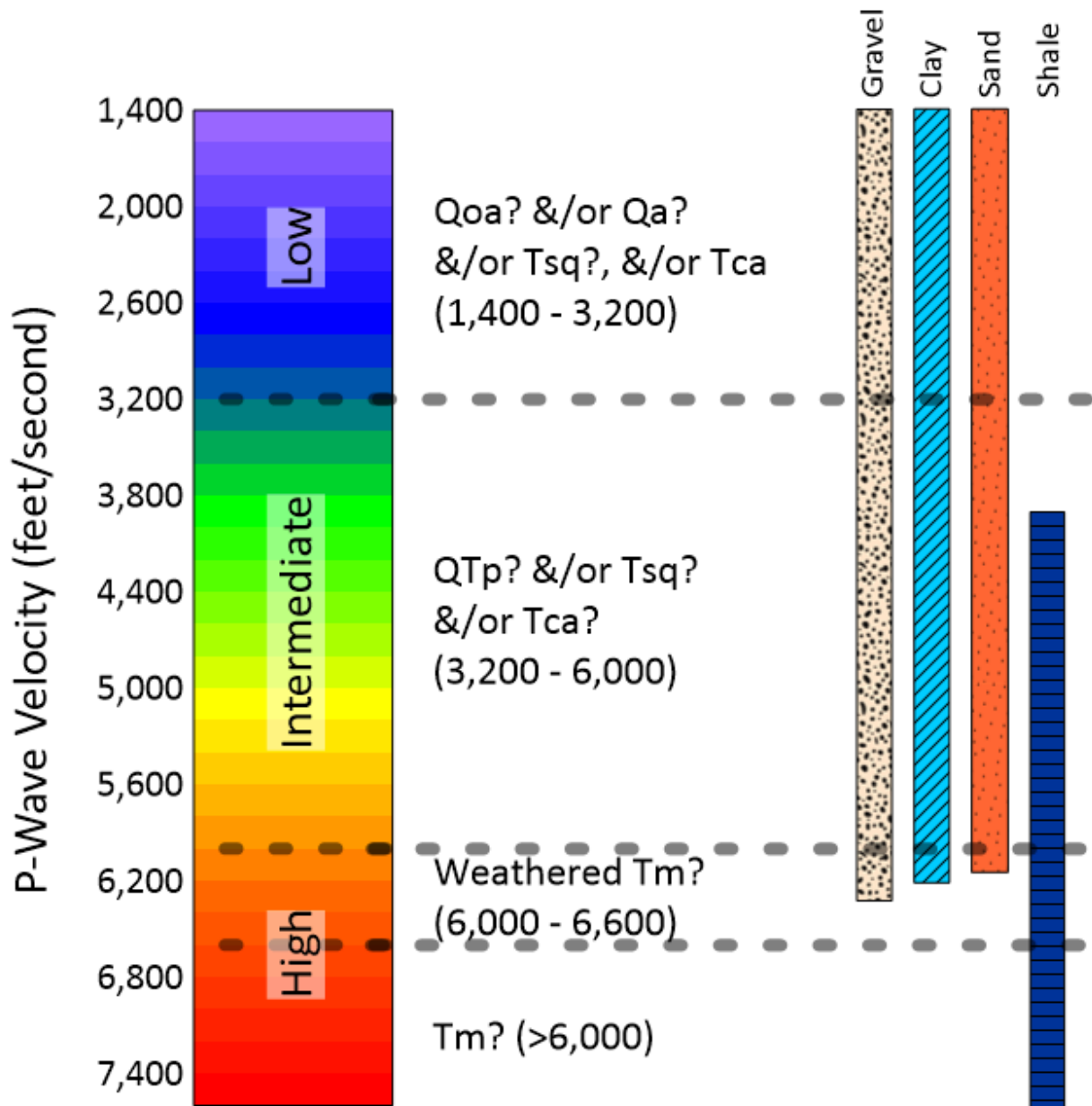
Interpretations of lithologic units are made on each figure to suggest possible boundaries for layers in the Santa Ynez Valley survey area. The interpretations are based on several criteria, and can be construed as somewhat subjective based on the lack of overlap with the survey lines and well locations, but are based on the nearby drilling logs, geological maps of the area, and review of all the seismic lines at several scales. The lithologic boundaries are based on:

- Consistently sharp, high-gradient transitions or boundaries in the seismic velocity contours noted throughout all of the profiles, which tend to be predominately associated with the following approximate seismic velocity ranges (in feet per second [feet/sec]):
 - 3,000 to 3,400
 - 5,900 to 6,100
 - 6,600
- Correlation with lithology from geological maps and drilling logs from nearby well lithology logs. Generalizing these drilling logs indicates a wide span of lithotype through the seismic velocity range (Figure 11). However, the logged shale consistently correlates with the higher seismic velocity areas of the profiles, gravels correlate to the regions of lower seismic velocity in the profiles, and clays and sands correlate with intermediate seismic velocity in the profiles. The well logs are offset from the survey lines between approximately 200 and 1,600 feet, and with the apparent heterogeneity in the subsurface may not accurately represent the lithology at

the overlaid location on the P-wave refraction profiles. In addition, few of the wells were cored, so it is difficult to be certain of the accuracy of the depth of lithology changes or determine the difference between unconsolidated gravel and lithified/consolidated units.

Figure 11 displays a generalized correlation of the interpretation criteria, with the seismic velocity boundaries separated into ‘Low’ ‘Intermediate’ and ‘High’ seismic velocity categories (based on the seismic velocity range observed in this survey), the range of lithotypes noted throughout these seismic velocities, and possible geologic units assigned to the seismic velocity structure.

Figure 11. Velocities and Interpretation Criteria for P-Wave Refraction Results.



6.2 LINE 2

Figure 13 displays the tomography model results (top profile) and the overlay with driller's logs from nearby wells (bottom profile) for the two segments of Line 2. Note that well CA-2's coordinates place it at the beginning of Segment 2-1, however the driller's map in the logs suggests it is approximately 2,000 feet to the east – due to inconsistency this log has been omitted from the figure.

In summary:

An extensive interpreted 'low' seismic velocity layer extends across Segments 2-1 and 2-2, which is between approximately 80 to 100 feet thick along much of Segment 2-1, although it thins to between approximately 50 to 60 feet towards the end of this segment and between 950 and 1,250 feet along the profile. This near-surface layer is approximately 40 feet thick at the beginning of Segment 2-2, thickening gradually after approximately 650 feet along the profile to approximately 120 feet thick at the end of this segment. The 'low' seismic velocity layer appears to correlate to the gravel units in the drilling logs and is interpreted as corresponding to the unconsolidated alluvial sediments, such as gravels, sands, and clays. However, correlating to the T.W. Diblee geologic map of this area would indicate Segment 2-1 transitions from unconsolidated alluvial sediments to the Careaga sandstone along the length of the profile, as indicated in Figure 13. There does not appear to be an obvious contrast or discontinuity in the seismic velocity contours observed along the profile that would differentiate between these two units. This potentially reflects the friable nature of the sandstone, with the formation possessing similar seismic velocities to the alluvial sediments in the survey area. Based on the T.W. Diblee geologic maps, the entire length of Segment 2-2 correlates to the Careaga sandstone, likely indicating the 'low' seismic velocity layer consists of this sandstone formation.

Below this layer, an interpreted 'intermediate' seismic velocity layer extends across both segments of Line 2. This 'intermediate' seismic velocity layer tends to correlate with more clay rich units or sands from the drilling logs along this profile, with the increase in seismic velocity relating to an increase in competency or stiffness of the sediments or that the sediments are cemented to some degree. Once again the offset between the wells and the survey lines is significant in the majority of cases, and the T.W. Diblee geologic map would tend to indicate a transition to the Careaga sandstone along Segment 2-1. The sharp increase in seismic velocity of the sandstone formation associated with the 'low' and 'intermediate' layers could indicate a decrease in weathering of the sandstone as we increase depth or the sandstone is becoming less friable and more competent with depth. Between the beginning of Segment 2-1 and approximately 700 feet along the profile, this layer extends to the imaging depth of the model results, approximately 250 feet along this section. The transition to the Careaga sandstone is located within this section of the profile, however once again we do not observe an obvious contrast or discontinuity in the seismic velocity contours that would indicate the interface between the alluvial sediments and sandstone formation. This would

suggest the two units are of similar seismic velocities. Between approximately 700 and 1,100 feet along the profile, the imaging depth was impacted by noise levels, thus we cannot resolve below the ‘low’ seismic velocity layer associated with the Careaga sandstone. Above 1,100 feet along the profile, the ‘intermediate’ seismic velocity layer is approximately 250 feet thick and extends to the imaging depth limit of the model results. Between approximately 1,350 feet along the profile and the end of Segment 2-1, this layer decreases in thickness due to a combination of the near-surface ‘low’ seismic velocity layer, Careaga sandstone along this section, increasing in thickness and the seismic velocity at the base of the model results also increasing, likely indicating a transition to potentially a more competent layer of Careaga Sandstone or weathered shale bedrock. The transition to the potential weathered shale or sandstone formation appears more diffuse, potentially indicating the weathered boundary is more extensive than the simplified dashed line that indicates the interface. The ‘intermediate’ seismic velocity layer in Segment 2-2 is on average approximately 100 feet thick, ranging between a minimum of approximately 60 feet at approximately 840 feet along the profile and a maximum of approximately 155 feet at approximately 160 feet along the profile. Based on the T.W. Dibblee geologic maps, the entire length of this layer for Segment 2-2 correlates to the Careaga sandstone. The increase in seismic velocity of the sandstone formation across the ‘low’ and ‘intermediate’ layers could indicate a decrease in weathering of the sandstone as we increase depth or the sandstone is becoming less friable and more competent with depth. The first half of Segment 2-2 displays sharp interfaces between the overlying ‘low’ seismic velocity layer and underlying ‘high’ seismic velocity layer, with the seismic velocities of the latter layer potentially indicating a transition to more competent shale bedrock with a very thin weathered zone. The second half of Segment 2-2 has a more diffuse transition to the underlying ‘high’ seismic velocity layer, again potentially indicating the weathered shale boundary is more extensive or that the Careaga sandstone associated with the ‘intermediate’ seismic velocity layer is increasingly more cemented or competent with increasing depth.

The lower interpreted ‘high’ seismic velocity layer extends across the base of the model results, from approximately 1,350 feet along Segment 2-1 and the entirety of Segment 2-2. Shale bedrock is identified from the driller’s logs in wells CA-3 and CA-5, both indicating a transition to bedrock at deeper depths. However, the driller’s logs do not display a good correlation to the interpreted seismic velocity interface for this survey line. This is likely a reflection of the significant offset of these wells from the survey line and the heterogeneity suggested in the lithology. Therefore, the interpreted seismic velocity interface representing the shale bedrock is taken from an average across the survey lines, with the seismic velocities potentially indicating weathered shale or more competent Careaga sandstones along Segment 2-1 and more competent shale bedrock along Segment 2-2. There appears to be minimal weathered bedrock along Segment 2-2, which may reflect the transition from the basin up the hillslope and an associated change in weathering of the underlying units. The upper surface of the ‘high’ seismic velocity layer is undulating in nature, potentially indicating some paleotopography.

Overall, it appears that we are imaging the shale bedrock unit along the entirety of Segment 2-2 and a short section on the north end of Segment 2-1, based on the interpreted interfaces associated with the seismic velocities. It is difficult to be certain on the accuracy of the interfaces based on the significant offsets between the wells and the survey line and the uncertainty on the accuracy of the driller's logs. In addition, it is difficult to assign a specific cut off in seismic velocity that correlates to the cemented sandstone/alluvium – weather shale and weathered shale – more competent shale interfaces based on the limited detail in the driller's logs. Instead, these interfaces in the P-wave refraction profiles are based on a combination of the significant gradients in the contours and correlations to the driller's logs. Additional coring and logging information from borings coincident with the seismic survey lines would be required to provide further constraints on the depths of these interfaces.

6.3 LINE 3

Figure 14 displays the tomography model results (top profile) and the overlay with driller's logs from nearby wells (bottom profile) for the three segments of Line 3. The line is displayed and described from northwest to southeast, although it was collected from southeast to northwest.

In summary:

An interpreted 'low' seismic velocity layer extends across all three line segment, with an average thickness of approximately 20 feet along the first half of Segment 3B-4. This layer then decreases in thickness to approximately 15 feet at approximately 550 feet along the profile before increasing in thickness, to approximately 35 feet, by the end of Segment 3B-4. The 'low' seismic velocity layer is on average approximately 25 feet thick along the majority of Segment 3B-1 before gradually increasing in thickness at approximately 180 feet to approximately 45 feet at the southeast end of Segment 3B-1. Segment 3A displays a significantly thicker 'low' seismic velocity layer, with approximately 70 feet thickness at the northwest end of the segment decreasing very gradually across the segment to approximately 50 feet on the southeast end. The three driller's logs associated with Line 3 all display significant offsets of >1,000 feet, but tend to indicate unconsolidated alluvial sediments, such as gravels, sands, and clays, in the depth intervals associated with the 'low' seismic velocity layer. This layer appears approximately flat lying, with minimal apparent scouring or undulations along the lower interface, suggesting a lower energy depositional environment. Correlating the survey lines to the T.W. Diblee geologic map the 'low' seismic velocity layer along Segment 3A likely reflects the unconsolidated alluvial sediments. This layer along Segment 3B-1 is again likely unconsolidated alluvial sediments, although the T.W. Diblee geologic map indicates a transition to the Sisquoc shale between approximately 450 and 700 feet along this profile. We do not observe any obvious contrast or discontinuity in the seismic velocity contours in this section, suggesting the shale and alluvial sediments are of similar seismic velocities if this transition is captured. The 'low' seismic velocity layer along Segment 3B-4 is again predominantly reflecting unconsolidated alluvial sediments based on the T.W.

Diblee geologic map, with a transition to the Sisquoc shale indicated above approximately 800 feet along the profile. Again, the seismic velocities for the shale and alluvial sediments appear similar, with no obvious contrast or discontinuity observed to indicate the interface between these units.

We observe a sharp interface to the underlying interpreted ‘intermediate’ seismic velocity layer, suggesting that, at this seismic velocity value, there is a transition in the lithology or properties of the alluvial sediments that corresponds to an increase in strength or stiffness of the materials. This layer extends across all three segments of Line 3, extending to the imaging depth limit of the model results for Segments 3B-4 and 3B-1, which is approximately 120 feet bgs for both segments. Across Segment 3A, this layer appears to transition to the interpreted ‘high’ seismic velocity layer at depth, with the interpreted ‘intermediate’ seismic velocity layer thickness being approximately 30 feet at the northwest end of the segment. The layer thickness increases gradually to the southeast to approximately 100 feet at approximately 260 feet along the profile, where it remains constant until the southeast end of the segment. This ‘intermediate’ seismic velocity layer correlates with more clay rich units or sands from the drilling logs along this survey line, with the increase in seismic velocity potentially relating to an increase in competency or stiffness of the sediments or that the sediments are cemented to some degree. The seismic velocity contours in Segments 3B-4 and 3B-1 display a gradual increase with depth, which could reflect a gradual increase in competency or increase in cementation of the sands and clays, for example. There does not appear to be a significant interface along these two segments that could signify a transition to the underlying bedrock unit. The T.W. Diblee geologic map would indicate a transition to the Sisquoc shale above approximately 800 feet along Segment 3B-4 and between approximately 450 and 700 feet along Segment 3B-1. There does not appear to be any obvious variation in the seismic velocity contours in these intervals, therefore the shale and alluvial sediments would appear to have similar seismic velocities if this transition is captured.

The lower interpreted ‘high’ seismic velocity layer is only evident along the base of the model results for Segment 3A, extending across the majority of this segment. Shale bedrock is indicated in the base of the driller’s log for well VHW, at a depth of approximately 160 feet bgs. Although the projection of this well does not overlap with the contoured model results in this location/depth, the trend in the ‘high’ seismic velocity layer interface does correlate with this interpretation. The seismic velocity contours within this layer suggest weathered shale, although it is difficult to confirm this based on the lack of detail in the driller’s logs and that the interpretation is based primarily on the seismic velocities observed. This layer is at a depth of approximately 100 feet bgs on the northwest end of the segment, increasing gradually to approximately 155 feet bgs at the southeast end.

Overall, it appears that we are imaging the shale bedrock unit only along the entirety of Segment 3A, based on the interpreted interfaces associated with the seismic velocities. The interpretation suggests weathered shale based on the seismic velocity, although once again it is difficult to be

certain on the accuracy of the interfaces based on the significant offsets between the wells and the survey line, as well as the uncertainty on the accuracy of the driller's logs.

6.4 LINE 4

Figure 15 displays the tomography model results (top profile) and the overlay with driller's logs from nearby wells (bottom profile) for Line 4. The survey line is displayed and described from west to east, although it was collected from east to west. Vertical exaggeration for the profile (8:1) is increased compared to the previous two survey lines.

In summary:

An interpreted 'low' seismic velocity layer extends across all the survey line, with an average thickness of approximately 30 feet between approximately 10,900 and 8,800 feet along the profile. This layer then increases in thickness to approximately 40 feet, before ranging between approximately 15 and 20 feet thick between approximately 7,780 and 6,030 feet along the profile. The 'low' seismic velocity layer thickness then increases sharply to approximately 40 feet, before sharply decreasing in thickness to approximately 10 feet at approximately 4,950 feet along the profile. The thickness of this layer remains constant until approximately 3,490 feet along the profile, where it displays an undulating nature until approximately 630 feet along the profile with minimum and maximum thicknesses of 20 and 65 feet, respectively. The thickness of this layer then remains constant until the east end of the survey line, approximately 30 feet. The three driller's logs associated with Line 4, while significantly offset from the survey line in the majority of cases, tend to indicate unconsolidated alluvial sediments, such as gravels, sands, and clays, in the depth intervals associated with the 'low' seismic velocity layer. The T.W. Diblee geologic map would indicate a transition to surficial sediments, valley and floodplain deposits, associated with the river channel between approximately 10,800 and 10,000 feet along the profile. Based on the unconsolidated nature of these deposits we would not typically expect a significant contrast in the seismic velocity and no obvious transition is observed in the profile. The lower interface of this layer appears to display a degree of undulation and/or scouring along the length of the profile. In addition, the lower interface displays a broader boundary than in previous survey lines in terms of the gradient of the seismic velocity contours, potentially indicating a more subtle or graded transition between lithologies along sections of the survey line (for example between approximately 2,765 and 805 feet along the profile). The majority of these occur in areas where the interface is undulating in nature, suggesting a relation to scouring or increased weathering of the lithology.

We again observe a sharp interface to the underlying interpreted 'intermediate' seismic velocity layer for the majority of Line 4, suggesting that, at this seismic velocity value, there is a transition in the lithology or properties of the alluvial sediments that corresponds to an increase in strength or stiffness of the materials. This layer extends across all of Line 4, extending to the imaging depth

limit of the model results for large sections of the western half of the survey line, ranging between approximately 60 and 130 feet bgs for this section. For the eastern half of the survey line, this layer appears to transition to the interpreted ‘high’ seismic velocity layer at depth, with the interpreted ‘intermediate’ seismic velocity layer thickness starting at approximately 85 feet at approximately 4,740 feet along the profile. The layer thickness display a sharp decrease to approximately 50 feet thick by approximately 4,175 feet along the profile; the layer thickness then varies over the next approximately 4,000 feet ranging between approximately 35 and 85 feet. The interpreted ‘intermediate’ seismic velocity layer then remains a constant thickness, at approximately 30 feet, until the eastern end of the survey line. This ‘intermediate’ seismic velocity layer correlates with unconsolidated alluvial sediments, such as gravels, sands, and clays, from the three drilling logs along this survey line. This contrasts with previous survey lines where observe logged clays and sands associated with this layer. Again, the offset of the wells from the survey line could be significant enough that the lithology varies over the interval between the well and survey. Alternatively, the increase in seismic velocity potentially relates to an increase in competency or stiffness of the alluvial sediments or that these sediments are cemented to some degree compared to previous survey lines.

The lower interpreted ‘high’ seismic velocity layer is evident along the base of the model results for the eastern half of the survey line, between approximately 4,775 and 0 feet, and for short sections on the western half of the survey line. Shale bedrock is indicated at the base of the driller’s log for well CA-10, beginning at a depth of approximately 95 feet bgs, and over the majority of the driller’s log for well CA-11, beginning at a depth of approximately 45 feet bgs. Again, both of these wells are significantly offset from the survey line and so there is likely to be some disconnect between lithology and seismic velocity contours based on the degree of heterogeneity observed in the logs across the survey area. However, the trend in the interpreted ‘high’ seismic velocity layer interface does correlate with the logged shale boundaries. The seismic velocity contours within this layer would suggest weathered shale, although it is difficult to confirm based on the lack of detail in the driller’s logs, and the interpretation is based primarily on the seismic velocities observed. On the eastern half of the survey line, this layer is at a depth of approximately 95 feet bgs at approximately 4,740 feet along the profile, before decreasing to approximately 55 feet bgs by approximately 4,075 feet along the profile. The section of survey line between approximately 4,075 and 2,165 feet along the profile displays an undulating nature, which could indicate a degree of scouring into the shale bedrock surface, with depth to the bedrock unit ranging between approximately 55 and 115 feet bgs. The interpreted ‘high’ seismic velocity layer interface then remains relatively flat lying, although the overlying topography varies producing a depth to bedrock range between approximately 110 feet bgs in the west to approximately 60 feet bgs to the east. To the west of approximately 6,000 feet along the profile we observe an intermittent transition to the weathered shale bedrock unit, most notable between approximately 7,120 and 7,960 feet along the profile and above 9,480 feet along the profile. Typically, the regions displaying weathered shale seismic velocities are within approximately 20 to 40 feet of the base

of the model results and differ to the continuous layering we have observed in the previous survey lines (where the transition to bedrock was present). This could reflect a higher degree of topography on the shale bedrock surface along this survey line, from increased scouring or undulations, and is reflected in a section of the bedrock interface to the east. Alternatively, this behavior to the west may be partially controlled by structure, for example from faulting or fracturing of the bedrock unit, with the seismic contour pattern between approximately 5,910 and 6,820 feet potentially representing a faulted block as indicated. However, if these are faults, they would trend roughly north-south, which is orthogonal to the overall structural fabric of the region, which trends roughly west northwest – east southeast and east-west as noted in the W.H. Diblee geological maps. Based on the interpreted bedrock interface location at the base of the model results across the western half of the survey line, the resolution of the method will be reduced and it is possible that we are not fully resolving the transition in places.

Overall, it appears that we are consistently imaging the shale bedrock unit only along the eastern half of the survey line, with a depth to bedrock range of between approximately 110 and 60 feet bgs. We do observe the transition to shale bedrock over short sections of the western half of the survey line, which is potentially due to significant topography on the shale bedrock surface, the effect of faulting along this section of survey line, or limited resolution at the base of the model results. Depth to bedrock ranges between approximately 80 and 40 feet bgs along the western half of the survey line. The interpretation would suggest weathered shale based on the seismic velocity, although once again it is difficult to be certain on the accuracy of the interfaces based on the significant offsets between the wells and the survey line and the uncertainty on the accuracy of the driller's logs.

6.5 LINE 5

Figure 16 displays the tomography model results (top profile) and the overlay with drillers logs from nearby wells (bottom profile) for the two segments of Line 5. The line was collected from north to south, and is described this way as well.

In summary:

An interpreted 'low' seismic velocity layer extends across both segments of the survey line. This layer is between approximately 10 and 20 feet thick from the beginning of Segment 5-1 to approximately 1,185 feet along the profile. A sharp increase in thickness is observed at approximately 1,185 feet along the profile, to approximately 40 feet thick, with the layer remaining between approximately 30 to 40 feet thick until approximately 2,570 feet along the profile. The 'low' seismic velocity layer thickness then decreases gradually to approximately 20 feet, remaining at this thickness between approximately 2,700 and 3,350 feet along the profile. Another sharp increase in thickness is observed at approximately 3,350 feet along the profile, to approximately 50 feet thick, before the layer gradually decreases in thickness to approximately 30

feet at the end of Segment 5-1. The ‘low’ seismic velocity layer displays a much smoother character along Segment 5-2, with an approximately 20-foot thickness at the beginning of the segment. The thickness gradually decreases to approximately 10 feet at approximately 780 feet along the profile, before increasing in thickness slightly, to approximately 15 feet, by the end of Segment 5-2. Four driller’s logs are associated with Line 5, with all four being projected along Segment 5-1 and again significantly offset from the survey line. The four logs are similar in lithology and indicate unconsolidated alluvial sediments, such as gravels, sands, and clays, in the depth intervals associated with the ‘low’ seismic velocity layer. The lower interface of this layer displays a degree of undulation and/or scouring along sections, with a number of sharp increases in thickness observed along the length of the profile. In addition, the lower interface displays a broader boundary in a number of locations, in terms of the gradient of the seismic velocity contours, potentially indicating a more subtle or graded transition between lithologies along sections of the survey line (for example between approximately 750 and 1,045 and 2,805 and 3,175 feet along the profile).

We again observe a sharp interface to the underlying interpreted ‘intermediate’ seismic velocity layer for the majority of the two segments making up Line 5, suggesting that, at this seismic velocity value, there is a transition in the lithology or properties of the alluvial sediments that corresponds to an increase in strength or stiffness of the materials. This layer extends across all of Line 5, and appears to extend to the imaging depth limit of the model results for the section between 610 and 1,900 feet along Segment 5-1, ranging between approximately 85 and 170 feet bgs for this section. However, it should be noted this section of Segment 5-1 corresponds to an area of limited imaging depth, likely a result of increase traffic noise levels along the first half of Segment 5-1. For the remainder of the survey line, this layer appears to transition to the interpreted ‘high’ seismic velocity layer at depth. The interpreted ‘intermediate’ seismic velocity layer is approximately 120 feet thick at the beginning of Segment 5-1, increasing to approximately 170 feet thick by approximately 610 feet where imaging depth becomes limited. The thickness of this layer then undulates between approximately 1,900 feet along the profile and the end of Segment 5-1, with a minimum of approximately 45 feet at approximately 2,240 feet along the profile to a maximum of 130 feet at approximately 3,110 feet along the profile for this interval. The thickness of this layer along Segment 5-2 continues the undulating nature with a number of sharp increases in thickness observed. On average, the ‘intermediate’ seismic velocity layer is approximately 35 feet thick, increasing to approximately 75 and 70 feet thick at approximately 45 and 380 feet along the profile respectively. The interpreted ‘intermediate’ seismic velocity layer correlates with a combination of unconsolidated alluvial sediments, such as gravels, sands, and thin clays, and clays from the four drilling logs along this survey line. The transition between these two lithologies displays a mixed response to the seismic velocity contours in the profiles, with well CA-15 indicating the transition from unconsolidated alluvial sediments to clay correlating well to the base of the interpreted ‘low’ velocity layer. However, wells CA-12 and CA-13 indicate the lithology transition correlates well to approximately the 5,000 feet/sec seismic velocity contour, suggesting

that the clays are associated with the stiffer (higher seismic velocity) section of the ‘intermediate’ seismic velocity layer. Well CA-14 indicates the ‘intermediate’ seismic velocity layer is associated entirely with the unconsolidated alluvial sediments, based on the projected location and depths of the driller’s log. Again, the offset of the wells from the survey line could be significant enough that the lithology varies over the interval between the well and survey. Therefore, the transition to this layer, and associated increase in seismic velocity, could be a response to an increase in competency or stiffness of the alluvial sediments or that these sediments are cemented to some degree, potentially corresponding to the seismic velocity interval 3,200 to 5,000 feet/sec. The seismic velocity interval 5,000 to 6,000 feet/sec could then correspond to the stiffer clays in the driller’s logs.

The lower interpreted ‘high’ seismic velocity layer is evident along the majority of the base of the model results for the survey line, with the exception of the interval between approximately 610 and 1,900 feet. The driller’s log along Line 5 does not indicate shale bedrock along the well depths, therefore the interpreted interface is based solely on the seismic velocity contour relationship developed in the previous survey lines. The seismic velocity contours within this layer would suggest weathered shale, although it is difficult to confirm based on the lack of detail in the driller’s logs. At the beginning of Segment 5-1, this layer is at a depth of approximately 135 feet bgs, increasing gradually to approximately 180 feet bgs at approximately 610 feet along the profile with a degree of undulation observed in the interface along this section. The section of survey line between approximately 1,900 and 3,630 feet along the profile displays an undulating nature, which could indicate a degree of scouring into the shale bedrock surface, with depth to the bedrock unit ranging between approximately 85 and 150 feet bgs. This could reflect a higher degree of topography on the shale bedrock surface along this survey line, from increased scouring for example. The interpreted ‘high’ seismic velocity layer interface then remains relatively flat lying between approximately 3,630 feet along the profile and the end of Segment 5-1, with the overlying topography also relatively flat lying in this interval with a constant depth to bedrock of approximately 110 feet bgs. Segment 5-2 displays an average depth to bedrock of approximately 50 feet bgs, however the depth to this interface is observed varying up to 40 feet over short distances. This is potentially due to deep weathering and erosion, or potential faulting and fracturing of the bedrock, or a combination of the two processes. Based on the T.W. Diblee geologic map potentially indicates that the southern end of Segment 5-2 correlates to outcropping shale bedrock. The character of the seismic profile in this location would not indicate shale bedrock seismic velocities, therefore we are either not capturing the potentially outcropping bedrock or the shale is heavily weathered where it does outcrop, displaying similar seismic velocities to the unconsolidated alluvium.

Overall, it appears that we are consistently imaging the shale bedrock unit along the majority of the survey line, with a depth to bedrock range of between approximately 50 and 180 feet bgs. The interpretation would suggest weathered shale based on the seismic velocity, although once again

it is difficult to be certain on the accuracy of the interfaces based on the lack of logged shale in the four driller's logs along this survey line and the uncertainty of using the seismic velocity contour relationship from previous survey lines.

6.6 LINE 6

Figure 17 displays the tomography model results (top profile) and the overlay with driller's logs from nearby wells (bottom profile) for the four segments of Line 6. Segments 6-2 and 6-3 were suspected of circumnavigating a bedrock 'high' (client communication).

In summary:

An interpreted 'low' seismic velocity layer extends across all four segments of the survey line. This layer is between approximately 10 and 20 feet thick from the beginning of Segment 6-1 to approximately 1,810 feet along the profile. The layer significantly increases in thickness, to between approximately 35 and 45 feet, between approximately 1,801 and 2,620 feet along the profile. The 'low' seismic velocity layer decreases in thickness at approximately 2,620 feet along the profile and is on average 20 feet thick until the end of Segment 6-1. This layer is approximately 50 feet thick at the beginning of Segment 6-2, with a sharp decrease in thickness observed between approximately 70 and 145 feet along the profile to approximately 15 feet thick. The 'low' seismic velocity layer then gradually decreases in thickness towards the end of Segment 6-2, where this layer appears to pinch out. This trend continues over into Segment 6-3, where this layer is approximately 5 feet thick at the beginning of the segment. We observe a gradual increase in thickness to approximately 15 feet at approximately 490 feet along the profile, after which the layer remains between 10 to 15 feet thick, predominantly reflecting variation in the ground surface topography until the end of the segment. The 'low' seismic velocity layer varies between approximately 10 and 15 feet thick for the initial 500 feet of Segment 6-4, it then increases in thickness, to a maximum of 35 feet across a channel like structure between approximately 500 and 1,200 feet along the profile. This layer decreases back to approximately 10 feet thick at approximately 1,200 feet along the profile, before increasing gradually in thickness down the hillslope to a maximum of approximately 30 feet at approximately 1,630 feet along the profile. The layer decreases in thickness to approximately 15 feet before remaining constant until the end of Segment 6-4. Five driller's logs are associated with Line 6; wells CA-16 and CA-17 are projected onto Segment 6-1 along the first 700 feet of the profile. The two driller's logs from these two well indicate similar lithology, with unconsolidated alluvial sediments, such as gravels, sands, and thin clays, along their length (which extends below the imaging depth limit of the model results in these locations). While this tends to associate the unconsolidated alluvial sediments with the depth interval associated with the 'low' seismic velocity layer, it does not correlate well to the remainder of the model results in this region. The disconnect for the lower depths may result from the significant offset of these two wells to the survey line, greater than 700 feet in both cases. The two driller's logs projected onto Segment 6-2, wells CA-18 and CA-19, display a good correlation

between the logged unconsolidated alluvial sediments, such as gravels, sands, and clays, in the depth intervals associated with the ‘low’ seismic velocity layer. The last well, CA-20, which is projected onto Segment 6-4 does not display overlap with the ‘low’ seismic velocity layer depth interval and again is significantly offset from the survey line. The lower interface of this layer displays a degree of undulation and/or scouring along sections, with a number of sharp increases in thickness observed along the length of the profile. In addition, the lower interface displays a broader boundary in a number of locations in terms of the gradient of the seismic velocity contours. This potentially indicates a more subtle or graded transition between lithologies along sections of the survey line (for example, between approximately 1,450 and 4,250 feet along Segment 6-1 and 520 and 1,200 feet along Segment 6-4).

We again observe a sharp interface to the underlying interpreted ‘intermediate’ seismic velocity layer for the majority of the four segments making up Line 6, suggesting that there is a transition in the lithology or properties of the alluvial sediments that is increasing the strength or stiffness of the materials at this seismic velocity value. This layer extends across all of Line 6, and appears to extend to the imaging depth limit of the model results for the section between 1,550 and 2,710 feet along Segment 6-1, ranging between approximately 80 and 175 feet bgs for this section. However, it should be noted that this section of Segment 6-1 corresponds to an area of limited imaging depth, likely a result of increased noise levels along this section of the survey line. For the remainder of the survey line, this layer appears to transition to the interpreted ‘high’ seismic velocity layer at depth. The interpreted ‘intermediate’ seismic velocity layer is approximately 70 feet thick at the beginning of Segment 6-1, increasing to approximately 80 feet thick by approximately 540 feet along the profile. The thickness of this layer then undulates between approximately 540 and 1,550 feet along the profile, the latter being where the imaging depth becomes limited, from a minimum of approximately 40 feet at approximately 840 feet along the profile to a maximum of 130 feet at approximately 1,460 feet along the profile for this interval. The thickness of this layer is on average approximately 90 feet between approximately 2,710 and 3,730 feet along the profile, after which it decreases to approximately 60 feet thick to the end of Segment 6-1. The ‘intermediate’ seismic velocity layer decreases in thickness for Segments 6-2 and 6-3, ranging between 20 and 35 feet across both segments. This layer increases in thickness as we transition to Segment 6-4, being approximately 60 feet thick at the beginning of this segment. It undulates to some degree between the beginning of the profile and approximately 905 feet along the profile, ranging between approximately 45 and 60 feet thick. At approximately 905 feet along the profile, the thickness of this layer increases sharply to approximately 100 feet, remaining a fairly constant thickness until the end of the segment, where it decreases in thickness to 600 feet. The interpreted ‘intermediate’ seismic velocity layer correlate with either unconsolidated alluvial sediments, such as gravels, sands, and thin clays, or shale bedrock from the five drilling logs along this survey line. As mentioned previously, the offset of the wells from the survey line could be significant enough that the lithology varies over the interval between the well and survey. Therefore, the transition to this layer, and associated increase in seismic velocity, is likely a response to an increase in competency

or stiffness of the alluvial sediments or that these sediments are cemented to some degree or a change in lithology to a clay rich unit.

The lower interpreted ‘high’ seismic velocity layer is evident along the majority of the base of the model results for the survey line, with the exception of the interval between approximately 1,550 and 2,710 feet along Segment 6-1. The driller’s log along Segment 6-2 indicates that the transition to shale bedrock is very shallow in this location, which correlates to hypothesis of a bedrock high in this region. This corresponds well to the ‘high’ velocity layer interface along Segments 6-2 and 6-3, which is particularly shallow in this region, ranging between approximately 35 and 80 feet bgs. In addition, the seismic velocity contours along Segment 6-2 suggest a transition to more competent shale bedrock between approximately 10 and 35 feet below the ‘high’ seismic velocity layer interface. At the beginning of Segment 6-1, this layer is at a depth of approximately 80 feet bgs, undulating only slightly in depth to approximately 580 along the profile, where it decreases in depth to approximately 55 feet bgs at approximately 860 feet along the profile. The depth to the shale bedrock interface increase gradually, to approximately 145 feet bgs at approximately 1,550 feet along the profile. In the interval between approximately 1,550 and 2,710 feet along the profile we do not observe a transition to the bedrock unit, likely due to the limited imaging depth and resulting reduction in resolution. Between approximately 2,710 and 3,730 feet along the profile, the depth to shale bedrock is relatively constant at approximately 105 feet bgs, before decreasing to approximately 85 feet bgs to the end of Segment 6-1. Along Segment 6-4 the depth to bedrock varies between approximately 80 and 90 feet bgs for the initial 905 feet of the segment, before increasing to approximately 130 feet bgs between approximately 905 and 1,240 feet along the profile. The depth to bedrock then decreases gradually as we approach the end of the segment, with the decrease generally following the surface topography to approximately 75 feet bgs. The T.W. Diblee geologic map potentially indicates that a section of the Segment 6-2 correlates to outcropping shale bedrock. The character of the seismic profile along Segment 6-2 would not indicate shale bedrock seismic velocities at the ground surface or in the near-surface, therefore we are either not capturing the potentially outcropping bedrock or the shale is heavily weathered where it does outcrop, displaying similar seismic velocities to the unconsolidated alluvium.

Overall, it appears that we are consistently imaging the shale bedrock unit along the majority of the survey line, with a depth to bedrock range of between approximately 35 and 145 feet bgs. The interpretation suggests weathered shale across the four segments based on the seismic velocity, with a transition to more competent shale bedrock along Segment 6-2. However, once again it is difficult to be certain on the accuracy of the interfaces based on the significant offsets between the wells and the survey line and the uncertainty on the accuracy of the driller’s logs.

Figure 12 P-Wave Refraction Tomographic Model Results for all Survey Lines.

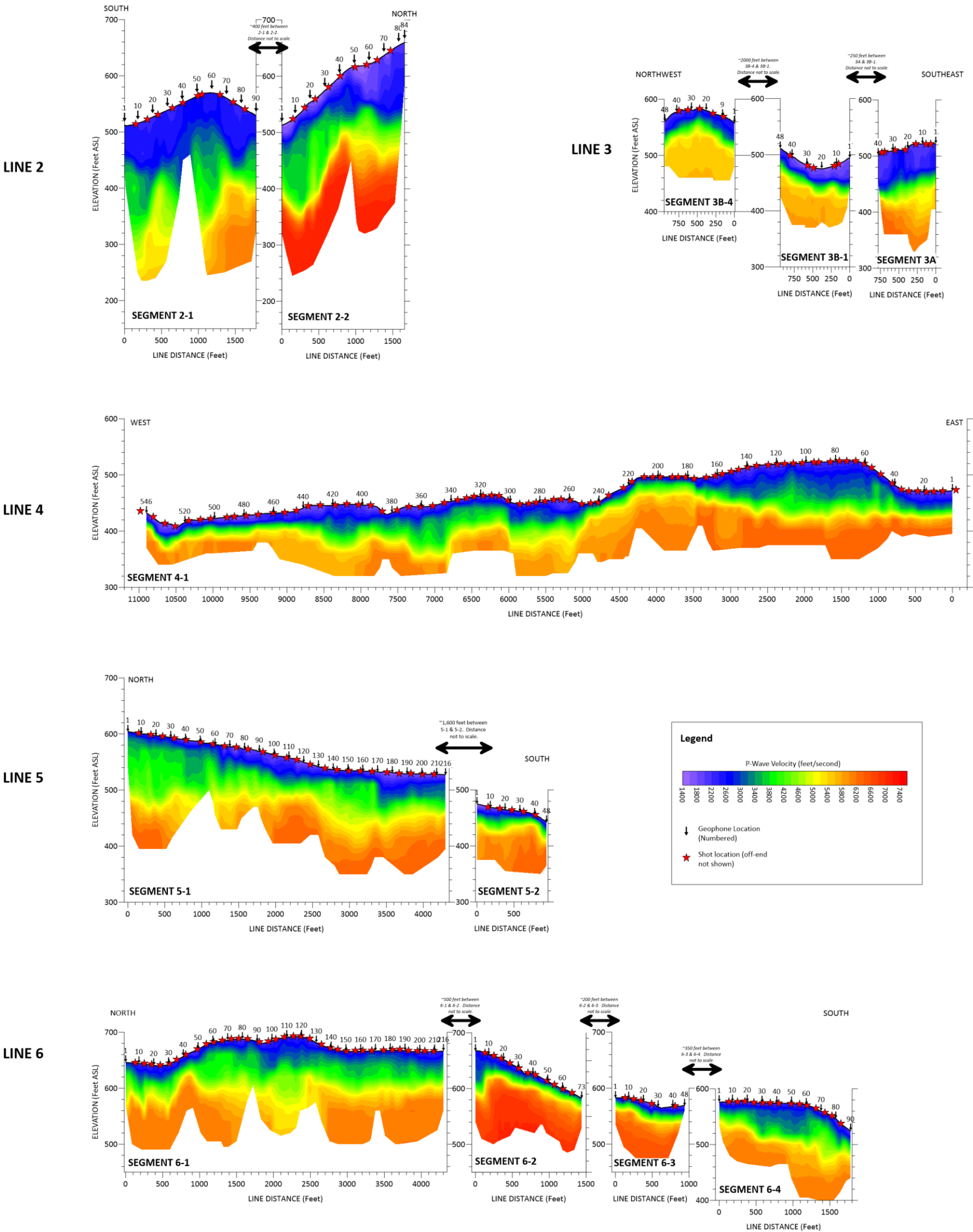


Figure 13. P-Wave Refraction Model Results for Line 2.

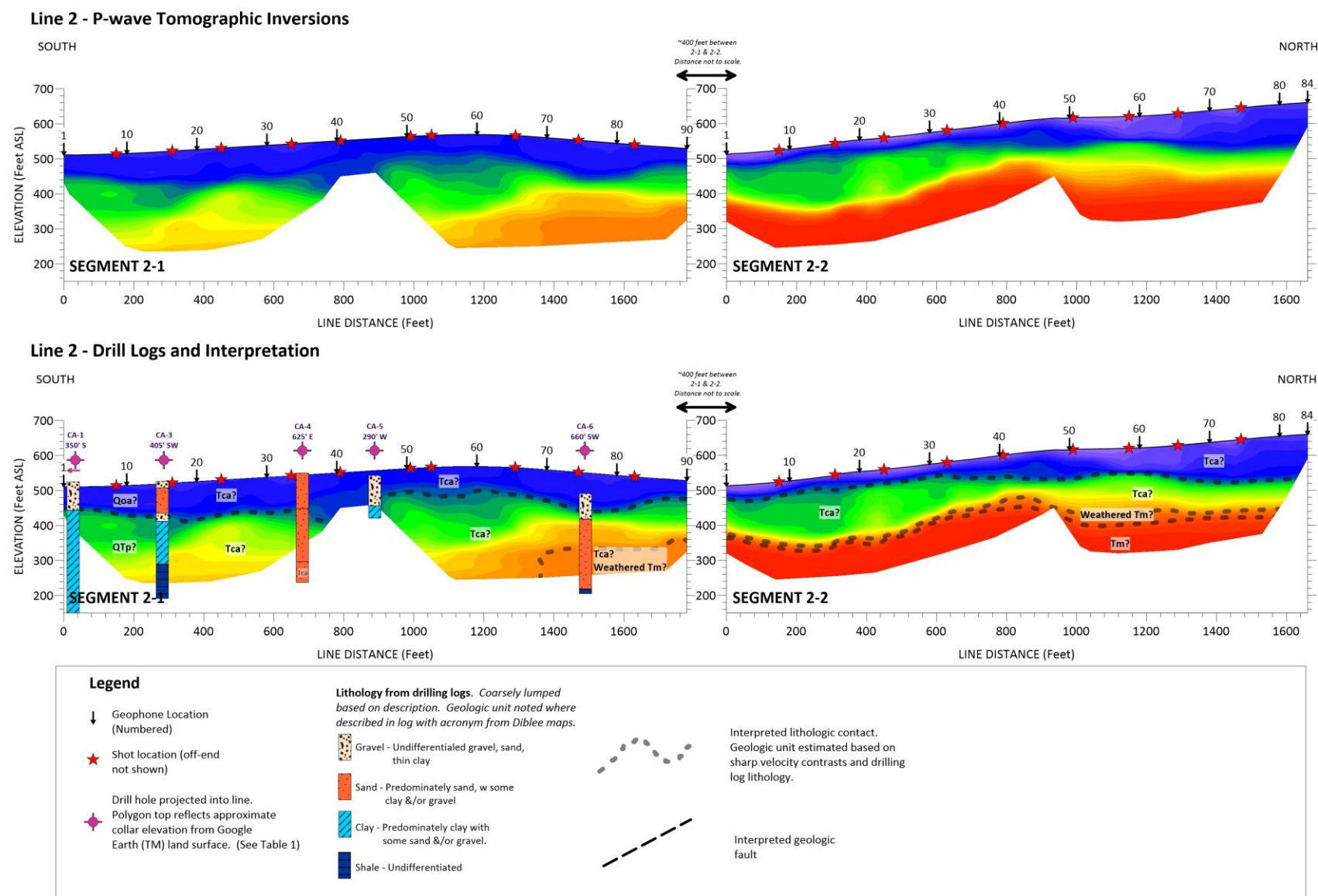


Figure 14. P-wave Refraction Model Results for Line 3.

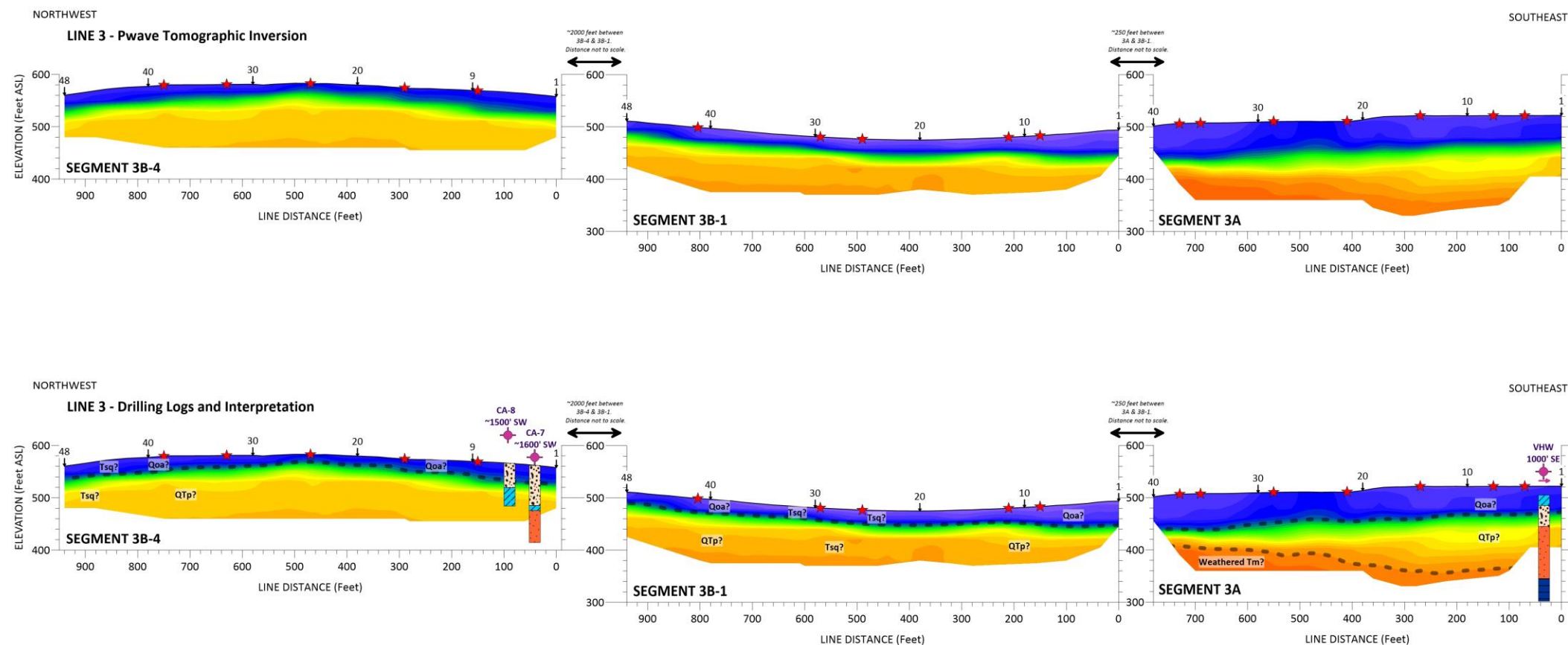


Figure 15. P-wave Refraction Model Results for Line 4.

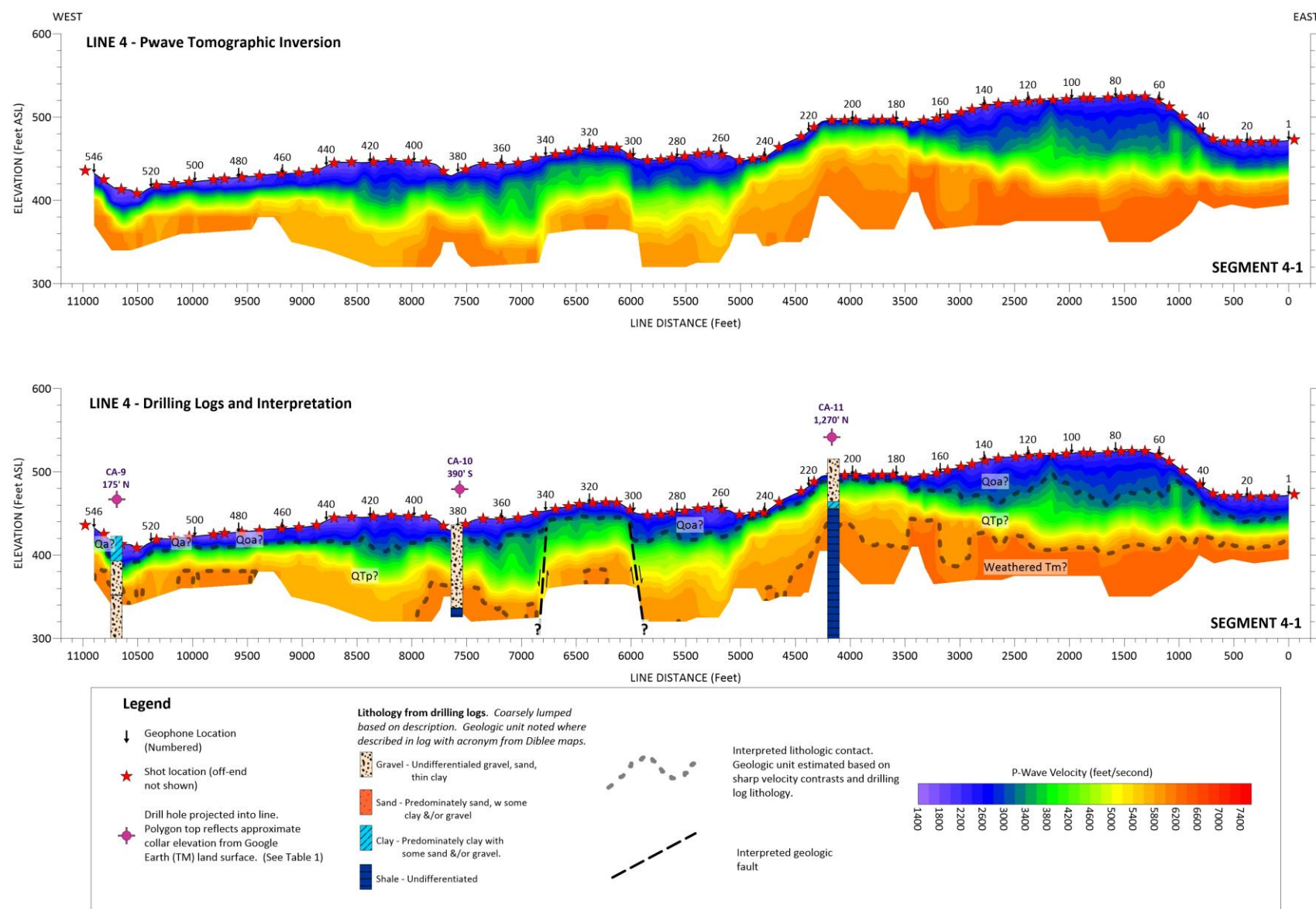


Figure 16. P-wave Refraction Model Results for Line 5.

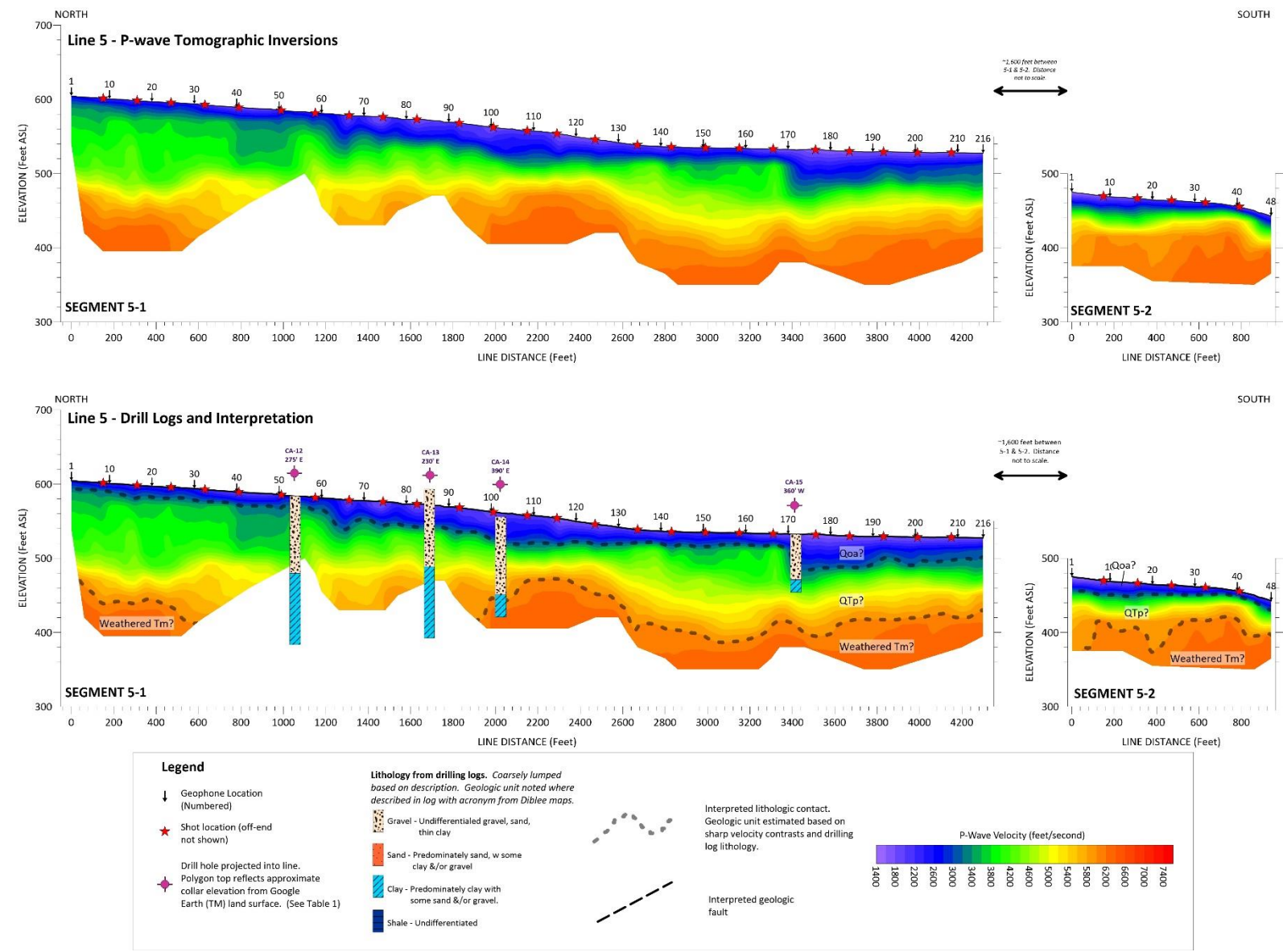
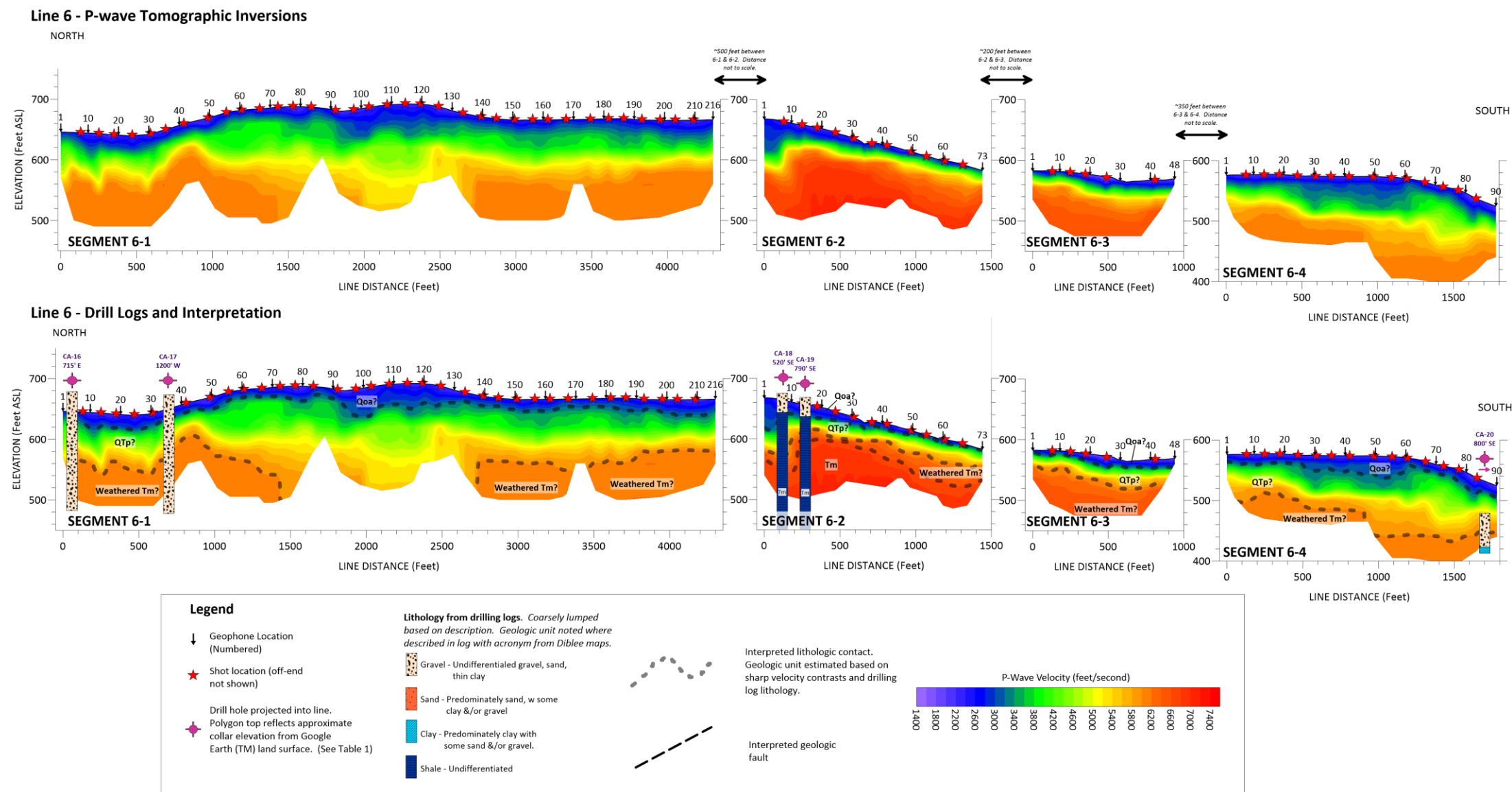


Figure 17. P-wave Refraction Model Results for Line 6.



7.0 SUMMARY

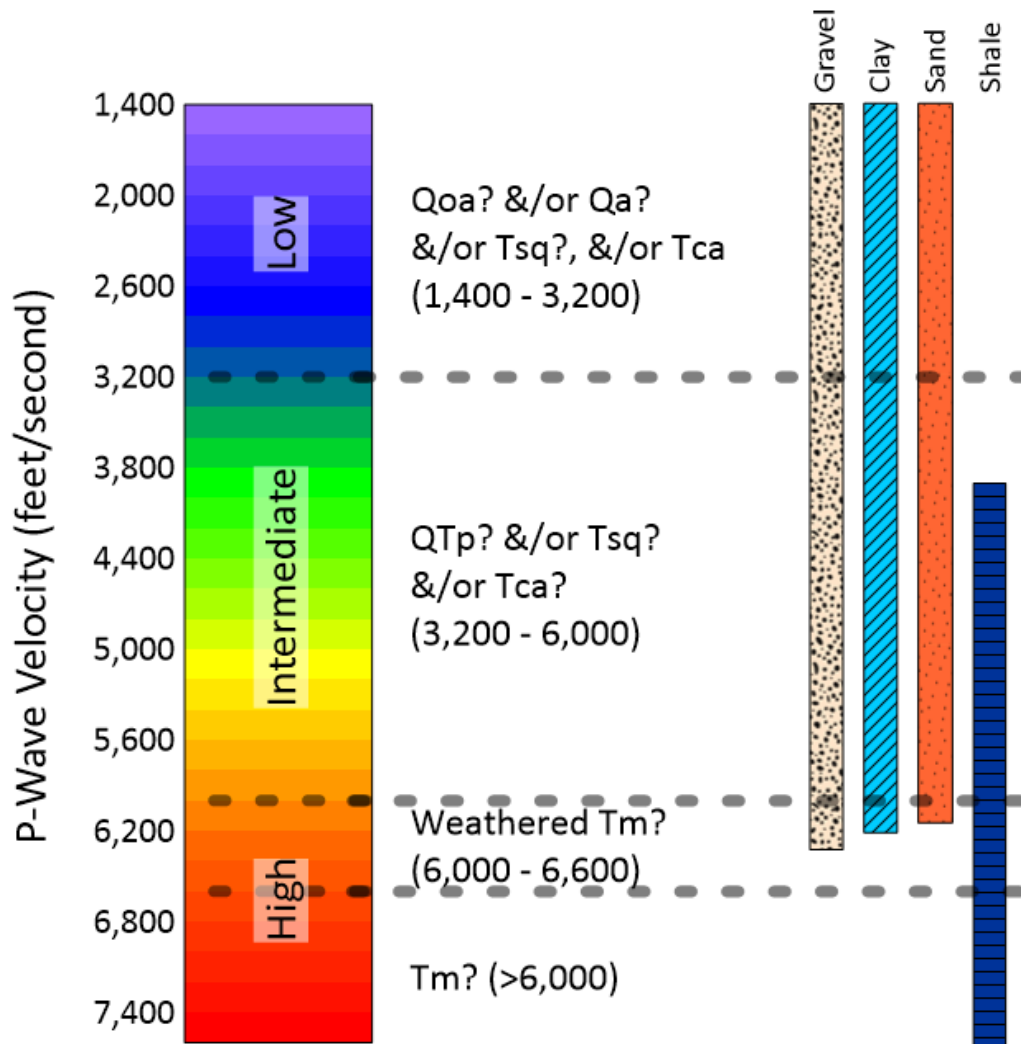
A geophysical investigation consisting of six survey lines of P-wave refraction was completed predominantly along roadways near the towns of Santa Ynez and Solvang, California. Data were acquired between July 28th and August 7th, 2020. The objective of the geophysical survey was to investigate the thickness of alluvial deposits and depth to bedrock across the Santa Ynez Valley, California. In summary:

- The P-wave refraction model results likely indicate a three-layer seismic velocity structure based on the trends in the contours and correlation to the available driller's logs from wells in the survey area. This has been interpreted as follows (also see Figure 17):
 - A near-surface 'low' seismic velocity layer, whose lower interface is interpreted as corresponding to the 3,000 to 3,400 feet/sec contour range (this is represented on the model result figures as the 3,200 feet/sec contour for simplicity). Based on correlations to the driller's logs and geological map, this layer likely predominantly represents the unconsolidated alluvial sediments, such as gravels, sands, and thin clays, and is possibly the terrace gravel unit. The lower boundary of this layer predominantly display a high gradient in seismic velocity, presenting a sharp boundary with the underlying layer. In some locations this boundary is much broader, potentially indicating the location of paleochannels or a more subtle or graded transition between lithologies.
 - A middle 'intermediate' seismic velocity layer, which spans the >3,400 feet/sec and 5,900 to 6,100 feet/sec contour range (the lower interface of this layer is represented on the model result figures as the 6,000 feet/sec contour for simplicity). In general, this layer correlates to logged clay rich or sand rich units, with the increase in seismic velocity potentially relating to an increase in competency or stiffness of the sediments or that the sediments are cemented to some degree. This layer could represent the Paso Robles formation and/or the Careaga sandstone unit.
 - A lower 'high' seismic velocity layer, with the seismic velocity interval 6,000 to 6,600 feet/sec potentially representing a weathered surface of the Monterey Shale, based on the driller's logs and the typical range for shale bedrock being 6,000 to 16,000 feet/sec. A sharp transition in the seismic velocity contours at approximately 6,600 feet/sec could represent the interface with more competent shale bedrock.
- There is a degree of uncertainty in the above interpretations based on the significant offset between the survey lines and the 'true' location of the wells from which the driller's logs correspond to. This offset is likely significant enough that the lithology varies over the

interval between the well and survey, based on the degree of heterogeneity suggested by the P-wave refraction profiles and the logs. Therefore, the interpretations are generally based on a combination of correlations to the wells and seismic velocity contour structure in the profiles. In addition, most of the well logs lump all gravel into one package, which limits their usefulness for interpretations.

- We observe a transition to the shale bedrock in all of the survey lines, with the exception of Segments 3B-1 and 3B-4. The depth to bedrock varies between approximately 35 and 200 feet bgs and is summarized in the digital delivery containing georeferenced locations of each survey line and interpreted depths to bedrock. In general, the seismic velocity of this layer would suggest weathered shale bedrock, with a transition to more competent shale bedrock only observed in Segments 2-2, 6-2, and 6-3, where it was anticipated bedrock would be shallower.

Figure 17. Seismic Velocities and Interpretation Criteria for P-Wave Refraction Results.



To improve the constraint on the interpretations, it is recommended that additional borings be conducted at coincident locations to the survey lines. Coring the additional borings would allow a more accurate determination of the contacts between the various formations (namely alluvium and bedrock) and determine the degree of weathering or cementation of these units, which could be used to improve the relationship between seismic velocity and lithology.

8.0 REFERENCES:

- Dibblee, T.W., and Ehrenspeck, H.E., ed., 1988, Geologic map of the Santa Ynez and Tajiguas quadrangles, Santa Barbara County, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-15, scale 1:24,000.
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