MONTEREY PENINSULA
WATER MANAGEMENT DISTRICT
5 HARRIS COURT, BLDG. G
POST OFFICE BOX 85
MONTEREY, CA 93942-0085 • PHONE: (831) 658-5600
FAX: (831) 644-9560 • http://www.mpwmd.dst.ca.us

Public Comment

Anyone wishing to address the Committee on a matter not listed on the agenda may do so during Public Comment.

DRAFT

AGENDA

REGULAR MEETING OF THE CARMEL RIVER ADVISORY COMMITTEE

****

Thursday, February 10, 2005, 10:00 AM

Community Room, Mid-Carmel Valley Fire Department

1. **CALL TO ORDER/ROLL CALL**

2. **PUBLIC COMMENT**

3. **CONSENT CALENDAR**
   A. Approve Minutes from the December 16, 2004 Regular Meeting of the Carmel River Advisory Committee

4. **CONSIDER PRESENTATION OF CERTIFICATES OF APPRECIATION TO CHUCK MCKAY AND ROD MILLS FOR SERVICE ON THE CARMEL RIVER ADVISORY COMMITTEE**

5. **UPDATE BY CLIVE SANDERS ON CARMEL RIVER WATERSHED COUNCIL ACTIVITIES**

6. **RECEIPT OF NATIONAL MARINE FISHERIES SERVICE ASSESSMENT OF ENVIRONMENTAL IMPACTS ON STEELHEAD IN LAS GARZAS CREEK FROM WATER EXTRACTION AT THE SANTA LUCIA PRESERVE**

7. **STAFF REPORTS**

8. **ITEMS TO BE PLACED ON FUTURE AGENDAS**

9. **ADJOURNMENT**

Staff notes regarding these agenda items will be available for public review on Monday, February 7, 2005 at the District office in Monterey.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
CARMEL RIVER ADVISORY COMMITTEE
FEBRUARY 10, 2005

1. CALL TO ORDER/ROLL CALL

2. PUBLIC COMMENT - Anyone wishing to address the Committee on a matter not listed on the agenda may do so during Public Comment.

3. CONSENT CALENDAR – Draft minutes from the December 16, 2004 regular meeting (**Exhibit A**) are included in this meeting packet.

ACTION REQUIRED: The Consent Calendar contains routine items that will be approved or accepted upon ratification of the Consent Calendar. A Committee member may request that a Consent Calendar item be considered separately by the Committee.

4. CONSIDER PRESENTATION OF A RESOLUTION OF APPRECIATION TO CHUCK MCKAY AND ROD MILLS FOR SERVICE ON THE CARMEL RIVER ADVISORY COMMITTEE

BACKGROUND: The Committee considered this item at their August 26, 2004 and October 14, 2004 Regular Meetings and agreed to recognize Chuck McKay and Rod Mills for their many years of service on the Committee. Staff will circulate a certificate of appreciation for the Committee members to sign at the February 10, 2005 Committee meeting.

5. UPDATE BY CLIVE SANDERS ON CARMEL RIVER WATERSHED COUNCIL ACTIVITIES

BACKGROUND: This is a regular agenda item. Clive Sanders, Administrator for the Carmel River Watershed Council (CRWC), will update the Committee about CRWC activities.

RECOMMENDATION: No action is required. This is a discussion item.

6. RECEIVE NATIONAL MARINE FISHERIES SERVICE ASSESSMENT OF ENVIRONMENTAL IMPACTS ON STEELEHAD IN LAS GARZAS CREEK FROM WATER EXTRACTION AT THE SANTA LUCIA PRESERVE

BACKGROUND: At their December 16, 2004 regular meeting, the Committee requested information on wells located in the Santa Lucia Preserve and their effects on flow in Las Garzas Creek. Enclosed as **Exhibit B** is a copy of a letter and attachments dated November 29, 2004 from the General Counsel for the National Marine Fisheries Service (the lead Federal agency responsible for managing steelhead in the Carmel River) to the Monterey County Board of Supervisors

concerning potential impacts to steelhead in Las Garzas Creek from water extraction at the Santa Lucia Preserve.

RECOMMENDATION: No action is required. This is a discussion item.

7. STAFF REPORTS - Staff will report on the following:

A) Emergency streambank repairs in January 2005 at the Lower Carmel River Restoration Project.

8. ITEMS TO BE PLACED ON FUTURE AGENDAS

Committee members should bring up any new business at this time to determine whether it should be included on a future meeting's agenda.

9. ADJOURNMENT

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EXHIBIT A

Draft
MINUTES

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
REGULAR MEETING OF THE CARMEL RIVER ADVISORY COMMITTEE
December 16, 2004, 10:00 A.M. Mid-Carmel Valley Fire Station Community Room

1. CALL TO ORDER/ROLL CALL

MEMBERS PRESENT:	Susan Rogers, John Dalessio, David Dilworth, Richard H. Rosenthal, Tom House, and Larry Levine
MEMBERS ABSENT:	Clive Sanders
PUBLIC PRESENT:	Darby Worth, Tom Moss (MCWRA)
STAFF PRESENT:	Andy Bell, Thomas Christensen, and Larry Hampson

2. PUBLIC COMMENT – Darby Worth, a former member of the Carmel River Watch (CREW), had three comments including: 1.) she encouraged the Committee to "think globally and act locally" and said she was concerned about the privatization of water around the world; 2.) she requested information on wells drilled at the Santa Lucia Preserve (formerly Rancho San Carlos); and 3.) she said the community should buy the California-American Water system.

3. CONSENT CALENDAR – Mr. House made a motion to approve the minutes of the October 14, 2004 Regular Meeting. Seconded by Mr. Levine. **Approval was unanimous.**

4. CONSIDER PRESENTATION OF A RESOLUTION OF APPRECIATION TO CHUCK MCKAY AND ROD MILLS FOR SERVICE ON THE CARMEL RIVER ADVISORY COMMITTEE –

MPWMD staff to finalize a certificaate for Committee members to sign.

5. PRESENTATION BY MONTEREY COUNTY WATER RESOURCES AGENCY ON CARMEL RIVER FLOOD ELEVATION STUDY – Tom Moss, Senior Hydrologist with the Monterey County Water Resources Agency (MCWRA), described an update of the Carmel Valley Flood Insurance Study (FIS). The current FIS was based on 1980 river topography that has changed significantly since adoption of the study in 1984. Floods in 1995 and 1998 caused extensive damage in Monterey County and resulted in 108 repetitive losses (i.e., flood damage of $1,000, or more, twice within a 10-year period). Of these, 94 were located in the Carmel Valley.

The new study will extend from the Carmel River lagoon to San Clemente Dam and is estimated to cost $600,000. MCWRA is contributing $100,000 toward the study and Community Services Area 50 (near the mouth of the river) is contributing $25,000. The new study is expected to be adopted by the Monterey County Board of Supervisors in mid-2006.

[Note: at this point, several members announced that they had to leave the meeting, so the agenda was changed to discuss Item 9 while there was a quorum of the Committee. However, the following information items was presented by staff to Tom House, David Dilworth, and Larry Levine.]

6. UPDATE ON THE SAN CLEMENTE DAM SEISMIC RETROFIT PROJECT – Larry Hampson reported that five alternatives were under consideration including: 1.) No Project; 2.) dam thickening with no sediment removal; 3.) removal of 19 feet of the dam 750 acre-feet (AF) of associated sediment; 4.) complete dam removal with re-routing the main stem into the San Clemente arm of the reservoir (limited sediment removal); and 5.) complete removal of the dam and 1,500 AF of associated stored sediment. A combined Environmental Impact Report and Environmental Impact Statement (EIR/EIS) was being prepared for Cal-Am under the joint direction of the California Department of Water Resources and the U.S. Army Corps of Engineers. Key issues under study include potential impacts from trucking of sediment and construction traffic and impacts to sensitive aquatic resources. The EIR/EIS was not expected to be completed until mid-2006.

7. UPDATE ON CARMEL RIVER WATERSHED COUNCIL ACTIVITIES – This item was postponed to the next regular meeting of the Committee, as Mr. Sanders was unable to attend the meeting due to a conflict.

8. STAFF REPORTS – Thomas Christensen reported that selected vegetation removal had been carried out at four sites in the bottom of the river between approximately 1,000 feet upstream of Boronda Road to a private bridge just downstream of Garland Park. MPWMD anticipates carrying out additional work in the bottom of the channel during the summer and fall of 2005.

9. ITEMS TO BE PLACED ON FUTURE AGENDAS

The following items were requested for the next meeting:

a.) discussion/presentation of information on Garzas Creek flow and wells at the Santa Lucia Preserve.
b.) invite a representative from Cal-Am to update the Committee on their rate case application tot he California Public Utilities Commission; and
c.) invite a representative from the Federal Emergency Management Agency to explain the Federal flood insurance program

The next meeting was scheduled for February 10, 2005.

10. ADJOURNMENT

The meeting was adjourned at approximately 11:50 p.m.

Office of General Counsel
Southwest Regional Office
501 W. Ocean Blvd., Ste. 4470
Long Beach, California 90802
Telephone: (562) 980-4091
Facsimile: (562) 980-4084

November 29, 2004

Monterey County Board of Supervisors
P.O. Box 1728
Salinas, CA 93902

Dear Board of Supervisors:

At the September 29, 2004 hearing before the Monterey County Planning Commission, the National Marine Fisheries Service (NOAA Fisheries) requested Monterey County delay certification of the Final Supplemental Environmental Impact Report (FSEIR) and approval of the tentative plot map until the Rancho San Carlos Partnership (RSCP) has completed a Habitat Conservation Plan for the Santa Lucia Preserve Comprehensive Development Plan. With incorporation of a completed Habitat Conservation Plan (HCP) into the final certification of the FSEIR for the Potrero Subdivision, the County will have fully protected itself, and ultimately county taxpayers, from legal liability under the Federal Endangered Species Act (ESA).

In testimony before the County Planning Commission on August 25, 2004, NOAA Fisheries cited *Strahan v. Coxe*, 173 F. 2d 155 (1st Cir. 1997), and its progeny as the legal precedents for finding state and local agencies liable under the ESA for issuing permits which result in take of federally-protected species. Mr. Strahan was a private citizen who sued the State of Massachusetts in Federal court for issuing permits to fisherman which resulted in violations of the ESA. The Federal Court of Appeals concluded that, through section 11 of the ESA, Congress expressly provided a mechanism for private citizens to ensure local government required compliance with the ESA when issuing permits for otherwise legal activities. In the *Strahan* decision, the Court found state and local agencies could be held equally liable for violating the ESA if compliance with the terms and conditions of an agency-issued permit resulted in a violation of the ESA.

The *Strahan* opinion is directly applicable to the decision the County must make with respect to the Rancho San Carlos development. In determining whether to certify the FSEIR and issue a tentative plot map for the Potrero Subdivision, the County must consider whether either of those actions will allow the RSCP to conduct activities which are likely to result in an ESA violation. Based on a review of available data and the environmental analysis performed to date, NOAA Fisheries has concluded the

development of the Potrero Subdivision, and its reliance on the Preserve-wide integrated water supply system, is likely to result in take of Federally-listed steelhead from reduced streamflows. Any harm or mortality of steelhead that occurs as a result of the development would be an ESA violation, which could serve as the basis for legal proceedings under Section 9 and/or Section 11 of the ESA.

The delay NOAA Fisheries has requested is *critical* because neither the Final Environmental Impact Report (FEIR 1995) nor the Final Supplemental Environmental Impact Report (FSEIR 2004) adequately address the environmental impacts of groundwater extraction on the surface flow of creeks that originate in the Santa Lucia Preserve. As described in detail in the enclosure produced by the NOAA Fisheries Habitat Conservation and Protected Resources Divisions, the assertions in the FEIR and SEIR of negligible and fully-mitigated environmental impacts are not supported by rigorous scientific or legally-defensible analyses; the analyses performed to date are insufficient to quantify the suite of direct and indirect effects of groundwater extraction on critical summer streamflows; and based on the information collected to date, it is highly likely that project use of extracted groundwater is impacting summer streamflows, leading to a significant reduction in available steelhead habitat quality and quantity.

Based on this assessment, NOAA Fisheries concludes the FEIR and FSEIR thresholds for triggering mitigations, which require nothing more than maintaining summer creek flows at multi-year drought levels, will dramatically reduce the number of juvenile steelhead that survive each summer. Low juvenile survival year after year is likely to lead to the demise of the steelhead populations in all five of the steelhead streams on the Preserve because the population will not have enough members to survive the impacts of natural variability elsewhere in its life history cycle. Given this assessment and the conclusions reached by NOAA Fisheries, the assertions in the FEIR and FSEIR of negligible and fully-mitigated impacts must be considered highly suspect and deserving of greater scrutiny.

Given the likelihood of potential impacts and the magnitude of the environmental consequences, NOAA Fisheries requests the County delay certification of the FSEIR and approval of the tentative plot map for the Potrero Subdivision until an HCP has been developed, which will provide the necessary protections for listed salmonids. Alternatively, NOAA Fisheries requests the Board of Supervisors approve the Monterey County Planning Commission's imposition of Condition 116, which would require the RSCP to obtain an incidental take permit before the County issues a grading permit or approves a final plot map.

Although the RSCP has been working with NOAA Fisheries on the development of an HCP for the Preserve for the past five years, the RSCP has not made significant progress toward completing the HCP and serious differences of opinion exist between NOAA Fisheries and the RSCP regarding the appropriate amount and extent of any mitigation for take of Federally-listed steelhead. Additionally, it is worth noting here

that the U.S. Fish & Wildlife Service has made a similar request of the County, asking that an HCP be developed for Federally-listed California tiger salamander, California red-legged frog, and the Smith's blue butterfly, before a grading permit is issued or a final plot map approved.

Thank you for your time and consideration of this important matter.

Sincerely,

Amanda R. Wheeland
Enforcement Attorney

Enclosure

cc: NOAA Fisheries Protected Resources Division
NOAA Fisheries Habitat Conservation Division
NOAA Fisheries Office of Law Enforcement
Kevan Urquhart, California Department of Fish & Game
Dave Perexta, U.S. Fish & Wildlife Service

Assessment of the Adequacy of the Environmental Impacts Analysis, and Required Mitigations and Monitoring Programs, of the Final and Supplemental Environmental Impact Report Prepared for the Santa Lucia Preserve and the Potrero Subdivision

As explained below, the assertions in the FEIR and SEIR of negligible and fully-mitigated environmental impacts are not supported by rigorous scientific or legally-defensible analyses. Furthermore, the body of environmental documentation is internally inconsistent on matters of great importance to the aquatic resources of the Santa Lucia Preserve ("the Preserve") and adjacent lands. Analyses performed to date are insufficient to determine the suite of direct and indirect effects of groundwater extraction on critical summer streamflows. As a result, further analysis and collection of scientific data are needed before the FSEIR is certified.

- **The conceptual model of the groundwater system underlying the Preserve is fundamentally flawed and thus inadequate for use in determining environmental impacts.**
    - Both the FEIR (1995) and the FSEIR (2004) identified the aquifer underlying the Preserve as a single hydrogeologic unit of fractured granitic bedrock. This simplistic identification may have been appropriate for basic regional water balance calculations. However, a rudimentary water supply feasibility study (water balance calculation) is incapable of quantifying localized impacts on a watershed scale; thus, it is inappropriate for use in describing the resulting environmental effects on the five steelhead streams on the Preserve.
    - Additionally, all of the environmental analyses performed assumed homogeneous[1] and isotropic[2] aquifer properties. Although the limited test data did not reveal anisotropy, the basic geology indicates the isotropic assumptions are suspect. This is further corroborated by the locations of streams and springs along faults and fractures, and the location of wells in the same fault/fracture zones. Flow patterns in fractured media are notably different than flow patterns in homogeneous isotropic porous media, with critical implications for the conservation of aquatic resources.
    - Neither the FEIR nor the FSIER acknowledge/consider the empirical evidence which demonstrates the Preserve's aquifer is a fractured rock

[1] To assume homogeneous aquifer properties implies that at all locations the same properties exist, including porosity, thickness, storativity and transmissivity. A very unusual geologic formation would have been required to produce the same amount and orientation of fracturing everywhere (Fetter 2001). Plutonic rock bodies, in particular, commonly have uneven or sporadic fracture zones that render them *heterogeneous*, not homogeneous.

[2] To assume isotropy, or isotropic conditions, implies the natural permeability of an aquifer is the same in all directions. "In fractured rock units, the direction of ground-water flow is completely constrained by the direction of the fractures. There may be zero permeability in directions not parallel to a set of fractures" (Fetter 2001), and the hydrogeology of the rock unit would then be *anisotropic*.

system with groundwater locations concentrated along geologic faults and fracture zones. This basic understanding of the Preserve's aquifer comes from conventionally-accepted knowledge of the regional geology, a tectonically active uplifted crystalline and sedimentary bedrock block. Use of a fractured rock aquifer model was indicated by the geophysical surveys and verified by observations of the weak lateral connections between the pumped and observation wells. The weak lateral connections were shown by the minimal change in the water surface elevation of observation wells when nearby test wells were pumped and their water surface elevations drawn down vertically to great distances. This information clearly indicated the effects of well pumping would be highly localized, not spread out across 20,000 acres as was assumed in the FEIR environmental impacts assessment.

- NOAA Fisheries has prepared a GIS map (Plate 1) to examine the locations of the Preserve's wells and their spatial relation to faults and fracture zones. As Plate 1 shows, well fields are concentrated along the faults, the intersection of faults, and in the expected fracture zones in the headwaters of each creek system. The pattern of well placement is indicative of the anisotropy found in the Preserve's aquifer.

- **The use of a flawed model has resulted in inappropriate assumptions; thus, the drawdown of groundwater underlying the Preserve has not been accurately described or estimated.**
  - The assumption in the FEIR and FSEIR that the Preserve's aquifer is one large permeable body was the justification for calculating water table drawdown effects over vast acreages (the legal boundaries of the Preserve - approximately 20,000 acres - or the somewhat larger acreage of all of the watersheds). This assumption would lead one to expect large diameter drawdown cones affecting large areas of the Preserve. However, the well tests directly contradict this assumed condition. The well tests show the drawdown cones are highly restricted horizontally and focused locally around each well. Consequently, distributing estimated aquifer drawdown over the entire area of the Preserve is not supported by the information collected.
  - The impacts of groundwater extraction are not uniformly distributed over the 20,000-acre Preserve. A more valid conceptual model, based on the known geology of the Preserve, would not have attempted to distribute aquifer depletion over huge areas. The groundwater is predominantly found at the source of baseflow for the streams, which is also where the well fields are located. Thus, the wells are having highly localized effects which are not accounted for in the environmental impacts analysis.
  - The water balance was performed as a desktop study without incorporating raw data from the field. As a result, the study used an aquifer storativity value of 0.03 (meaning for every foot of aquifer depth, 0.03 feet of water can be extracted or recharged), while the well tests and

hydrologic studies empirically show a storativity value of 0.01 for the production wells. This discrepancy (of a seemingly small and unimportant value) has the effect of greatly over-estimating aquifer recharge rates and under-estimating groundwater contribution to streamflow, by a factor of three. It would also mask the variation estimates from season to season, year to year, and drought to wet years. Moreover, the 0.01 storativity value may be higher than the true value because it was based on wells drilled in areas that were expected to have a lot of fractures. Testing across the Preserve's 20,000 acres, including areas not expected to have water, would likely result in an average storativity value substantially less than 0.01. This would significantly alter the water balance components as well as the impacts assessments.

- **The estimated effects of groundwater pumping on summer/fall streamflows are inaccurate and grossly misleading. Although reductions in streamflow due to project pumping may be difficult to 'measure', that does not mean reductions are not occurring.**
    - The flow of springs and streams during baseflow seasons is a function of hydraulic head between the groundwater aquifer and the land surface. Any decline in the elevation of groundwater decreases head, and consequently, reduces flows in springs and streams during baseflow seasons. The effects of aquifer anisotropy, and the location of wells along fault/fracture zones, concentrates head reductions in those fault/fracture zones, which is also where the streams are located.
    - Spring flow and stream baseflow are potentially very sensitive to localized head reductions caused by groundwater pumping in fractured rock aquifers (Fetter 2001) because hydraulic head acting on the network of fractures essentially forces water to the surface through fractures acting as conduits.
    - There is no scientific justification for the assertion in the FSEIR that 95% of project water will come from groundwater that would have become streamflow during the wet seasons. NOAA Fisheries agrees with Jones and Stokes (1994) who stated: "However, the mechanism by which pumping effects could be deferred from the dry season to the wet season is unclear." (pg. 8-47). The physical mechanism for streamflow reduction is the same during the wet or dry season, either induced infiltration through the streams' wetted areas or reduced aquifer return flow to streams as a result of decreased regional or local groundwater level. Based on the limited data available, the only reasonable assumption would be a reduction in streamflows **nearly equally distributed** between the wet and dry seasons. This was the approach taken by the original EIR consultant (Jones and Stokes 1995, Final Revised Draft EIR). This reasonable and conservative approach was left out of subsequent versions of the EIRs for this project.

- *The Comprehensive Hydrologic Study* (CHS)[3] states that "95% of project water demand will be derived from ground water that would have become streamflow" and "ground water inflow (*to the streams*) will be reduced primarily during the wet seasons" (CHS pg 9-10). The water balance in the CHS is a feasibility-level study only and as such is incapable of, and inappropriate for, quantifying the reduction in streamflow for any particular season. Indeed, in page 24 of Supplement No. 2, the CHS clearly states: "The goal of the water balance is to ***estimate*** the components over a period of years. *Thus the water balance should not be used in impacts analysis to quantify the reduction in groundwater that would have become stream flow for a specific month in a specific year.*"
- However, even if we accept the unsubstantiated premise that streamflow will be reduced "primarily during the wet seasons", if only 5% of project water demand is met by extraction of ground water that would have become streamflow during the dry season, this reduction would correspond to approximately 20 acre-feet/year annually (5% of 400 acre-feet/year). Additionally, the streamflow reduction is not consistent or constant over the dry season. Rather, the reduction increases as time progresses until rainfall resumes and the wet season begins. Thus, the reduction of streamflows is proportionately greater in the latter months of the dry season, when streams have the least amount of water, and a small reduction in streamflow will have significant environmental consequences, reducing the quantity and quality of aquatic habitat.
- The CHS estimated that a 3% reduction in streamflow corresponds to an average 0.1 cfs reduction in total streamflow. In H.J Morel-Seytoux's example (September 6, 2003), using reasonable streamflow ranges from the CHS of 4.88 cfs during eight wet months and 0.20 cfs during four dry months, with a proportionately greater reduction in flow in the eight wet months (0.11 cfs), and slightly less reduction in the four dry months (0.08 cfs), the result is a wet period percentage loss of only 2%, but a dry period percentage loss of 40%. This percentage loss would be even greater during dry months in drought years.
- As stated above, the CHS water balance is only appropriate for estimating *annual* averages for streamflow reduction. The monthly and daily effects are not analyzed or considered. However, the monthly and daily effects will mean the difference between life and death to water-dependent organisms. Neither the FEIR nor the FSEIR attempted to estimate the localized monthly or daily effects of aquifer depletion resulting from ground water extraction.
- Numerous conclusions in the FEIR, FSEIR, and supporting environmental documents are qualified by the statement, "effects would be undetectable using standard hydrological practices." This statement is grossly misleading because it implies no effect is occurring.

[3] This is the primary CEQA document supporting the water-use related conclusions of the FEIR and SEIR.

- Because a feasibility-level water balance analysis cannot quantify environmental impacts, it should not have been used to imply no effects would occur. Widely-accepted scientific methods could have been applied and the effects actually quantified.
- Throughout the EIR process, the professional hydrologists of the Monterey Peninsula Water Management District (MPWMD) submitted comment letters (CHS 1994; FEIR 1995; FSEIR 2004) recommending a more sophisticated model of the hydrology of the Preserve to quantify environmental impacts. Ignoring these repeated MPWMD comments is a central failing of the CEQA documentation for this project.
- The information developed on the Preserve's hydrological resources and groundwater and surface water interaction processes was an adequate starting point to inform exploration of groundwater availability on the Preserve. However, many more questions were raised than answered by the early studies, a trend that continued with subsequent studies.
- Although the environmental documentation and studies may have been adequate for a conceptual or feasibility level analysis, they are not adequate to: (1) assess site-specific localized effects; (2) test the various hypothesis used in the effects analysis; (3) refine the models used to predict effects; (4) inform adaptive management of limited resources; or (5) trigger the need for appropriate mitigation.
- It is clear that the most fitting use of the current environmental documentation is for a feasibility-level water supply analysis only, not an analysis of potential effects.

- **The interaction between groundwater and springs, seeps, and stream baseflows is not accurately or adequately addressed.**
  - The fact that a strong hydraulic connection exists between streams and the aquifer is shown in the CHS groundwater contour map. If there is no hydraulic connection between the aquifer and the streams, then there is no reason why subsurface flow should follow the regional topography, which is exactly what is shown on the map.
  - "Seeps and springs occur in areas where groundwater intersects the ground surface." (CHS pg 6-21). The environmental studies failed to develop this fundamental hydrologic data or assess its implications. We therefore prepared a GIS map that shows stream reaches where the aquifer water surface elevation exceeds the topographic elevation (Plate 2). Plate 2 provides a reasonable definition of 'baseflow reaches' for all streams emanating from the Preserve. The definition of 'baseflow reaches' in the FEIR and FSEIR must be revised to reflect the fact that wells drilled in any of these areas would have initially been artesian. Before these wells were drilled, the water table surrounding the creeks had a significant amount of head pressure; head dictates the rate of flow into the springs and seeps of the creek. Baseline streamflow conditions have not been systematically quantified, nor the natural variability quantified.

Consequently, the management and conservation of aquatic habitat is not adequately addressed.

- Springs were also found in proximity to the contact zone between the aquifer and regional topography. Although the accuracy of our effort was limited by the available data, this method should have been used to accurately identify the hydraulic connections between springs, streams baseflows, and the aquifer.
- In making the claim that aquifer depletion does not affect summer baseflow in the creeks, Fugro 2003 relied on the unsupported assumption that soil moisture perched above the aquifer is the major source of summer base flows on the Preserve (Fugro 2003). In the absence of scientific data showing soil moisture perched above the aquifer contributes to summer baseflow, it is a far stretch for Fugro to assume summer baseflow exists because of perched groundwater. Additionally, this unsubstantiated claim by Fugro is directly contradicted by the CHS water balance that found evapotranspiration exceeds soil moisture during the summer base flow portions of each year. The Preserve is, after all, in an arid environment in summer and fall.
- Similarly, the FEIR and FSEIR assume the implementation of better grazing practices will fully mitigate the impacts of groundwater pumping through increased infiltration of rainfall. Scientific information showing increased soil moisture results from reduced grazing is well-developed in the southern Great Plains. However, increased soil moisture does not necessarily result in increased aquifer recharge, as plants have the ability to quickly adapt to climatic changes. Corroborating evidence that implementing the proposed grazing plan will increase groundwater recharge, based on the collection of real data on the Preserve to confirm this process and its actual benefits, was not collected. It is therefore inappropriate to assume this condition will occur.

- **To state that the results of the stream-aquifer connection tests were "inconclusive" is inaccurate and misleading. Questions raised by the small sample require further investigation.**
  - Only 3 out of the 60 wells were physically tested for connection with nearby streamflow. In one of those three wells, T11, streamflow decreased in an amount equal to the pumping rate within 5 days, thereby quickly establishing a hydraulic connection between well pumping and streamflow. If a valid conceptual model of the stream – aquifer interactions had been used, this type of relationship would likely have been found at many locations across the Preserve.
  - The measurement of streamflow in natural channels is difficult to do, and small flows are especially difficult to measure precisely. For example, the 15 gallon per minute depletion of flow in well T-11 was registered as a 0.02 foot stage change in the nearby stream (Jones and Stokes 1995, pg. 8-44). This small stage change corresponds approximately to the detection

limits of the equipment used (most likely 0.01 feet). Consequently, the detection limitations of the equipment may have prohibited finding flow rate reductions at the other streams tested. Furthermore, streamflows were declining during the tests and the decline may have masked the effects of pumping.

- Well locations were selected on the basis of horizontal proximity to streams for analyzing the potential effects of well drawdown on nearby streamflows. However, the radial extent of drawdown cones were calculated using aquifer assumptions that are incorrect, as demonstrated above. In the CHS (1994), it was assumed that an isotropic porous aquifer existed, thereby making the use of circular cones of depression appropriate. However, a fractured rock aquifer does not behave like an isotropic aquifer (as assumed). Instead of a circular cone of depression, a drawdown cone elongated in the direction of the fracture pattern alignment should have been expected, and tested for, using more sophisticated field and analytical methods. If the model indicating elongated drawdown cones would have been used, then the impacts analyses would have been very different and resulted in a more apt description of the real physical processes occurring in the aquifer and the creeks that flow through the Preserve.
- Streamflow monitoring stations were located upstream from, and adjacent to, the wells tested for hydraulic connections. Given that the groundwater table slopes downstream, the greatest declines in streamflow would be expected downstream from wells. This should have been anticipated during the well-stream interaction tests and accounted for by placing monitoring stations downstream from wells.
- Calculations of potential well drawdown ranges show a doubling of drawdown cone radii from 30 days to 120 days (Fugro 2003). Given that this calculation is based on a linear relationship, radii enlargement would continue over time. Consequently, it is reasonable to conclude that all cones of depression would intersect streamflow after a few more months of pumping or pumping at higher rates.
- Using GIS, NOAA Fisheries plotted all wells and streams to determine the distance between each well and the nearest stream (NOAA Fisheries Table 1). This analysis was then compared with Table 2 in Fugro (2003). Our GIS analysis found 34 wells were located within approximately 800 feet of streams, while Fugro listed only nine wells within 1000 feet of streams, labeling their analysis a "worst case scenario." Thus Fugro, in their analysis of a "worst case scenario", made the unsupported and likely mistaken assumption that only a small percentage of wells located near streams could potentially impact streamflow.
- Well tests at T11 showed a reduction in streamflow equal to the amount of water pumped from the well. Differences in water quality samples collected from the stream and well were used to cast doubt on this demonstrated direct hydraulic connection between well pumping and

streamflow. However, a simple explanation for the water quality differences was not examined. The fact that water quality pumped from the well remained similar or unchanged can be explained by the accumulation of ions as stream water passed through 720 feet of rock thickness to reach the pumping well. That there remained differences in water quality between the well and the stream suggests the pump test simply did not run long enough to allow water from the stream to travel the lengthy distance to the well. The 'alleged' lack of a hydraulic connection based on puzzling water quality testing results should have been thoroughly addressed and analyzed before it was used as "evidence" against a finding of hydraulic connection between the streams and wells.

- Other wells were known to exhibit evidence of hydraulic connection to streams. The FEIR (1995) states: "Water levels in wells near creeks often recover abruptly when streamflow commences in winter, and the recovery ends equally abruptly at a water level close to the creek level. Wells S-1, T-20, T-26, E-5, and S-2 are near creeks and their hydrographs demonstrate this pattern" (pg. 8-45). The evidence of hydraulic connection with other wells and streams was not further investigated. Furthermore, the evidence seems to have been lost as subsequent environmental documents failed to mention these observations.

- **Cumulative effects of groundwater pumping, and those effects on streamflows, have not been refined over time even though new information has become available.**
  - The FEIR states: "The combined pumping rate of project wells in summer also substantially exceeds the combined base flow rate of springs and creeks on Rancho San Carlos…..[by] two to six times. Some of the dry season pumping effects will be absorbed by local groundwater storage declines near the well, but wells close to base flow reaches will probably deplete base flow. The effects of pumping on base flow cannot be deferred entirely from summer to winter…." (pg. 8-45). To date, only three wells have been physically tested for hydraulic connection to nearby streams.
  - Hypothetical well drawdowns were evaluated twice: in CHS 1994 and Fugro 2003. Both evaluations looked at wells independently of other production wells and assumed hydrogeologic conditions that do not exist.
  - Because of proximity, and alignment along faults and fractures (anisotropy), well field pumping should have been addressed with more rigorous and appropriate analytical methods that account for anisotropy and heterogeneity of the aquifer, and for the cumulative effects of the entire water supply system functioning at maximum demand capacity.

- **One of the reasons the FSEIR in inadequate and inaccurate is because more than eight years have passed since the development of the FEIR, and the**

RSCP still has not met some of the key Conditions of Approval imposed by the County of Monterey for the Comprehensive Development Permit.

- Condition of Approval No. 13 required the installation of observation wells along "protected base flow reaches" to monitor drawdown of the water table along the streams and riparian corridors. With the exception of Potrero Canyon Creek, the RSCP has not installed observation wells along base flow reaches. As a result, a scientifically-valid analysis of the interaction between well pumping and streamflow has not been performed.
- Condition of Approval No. 14 required the measurement of daily baseflows near the boundaries of the Preserve in Las Garzas, Potrero Canyon and San Clemente Creek. The RSCP did not measure daily flows at the boundaries of the Preserve until 2002. The RSCP did not install a flow gage in Potrero Canyon or San Clemente Creek until 2002. The Potrero Creek gage was not installed near the boundaries of the Preserve as required by Condition 14. Instead, it was installed upstream of the influence of well T11.[4] The operation of well T11, located 59 feet from the creek, was shown in initial testing to reduce streamflow in Potrero Canyon Creek (CHS 1994). No measurement of daily flows near the boundary of the Preserve occurred in Las Garzas Creek until a gage was installed by the MPWMD in 2001.
- As the RSCP has not put forth any explanation for this delay, we can only speculate as to why the RSCP did not comply with Condition of Approval No. 14 until the golf trail was completed, the wells drilled, and the water system had been up and running for several years.
- By delaying compliance with Condition of Approval No.14 until several years of operation had elapsed, the ability of this component of the monitoring program to determine impacts to the creeks was severely compromised. Without any pre-development hydrographs, interpretation of the stream gage data that has been collected is purely subjective, and the intent of this Condition of Approval, namely determination of the effects of ground water pumping on summer baseflows, has been precluded.
- Measurement of daily flow in San Jose Creek was not required under Condition of Approval No. 14. However, data from San Jose Creek show a reduction in streamflow in San Jose Creek over the past two years; in late-summer of the below-normal 2002 water year, San Jose Creek had continuous flow from the center of the Preserve (Stickleback Pond) to the Coast (NOAA Fisheries 2002). In 2004, San Jose Creek was dry from the Coast to nearly five miles upstream[5], indicating San Jose Creek summer flows and associated fisheries habitat have been significantly reduced, potentially as a result of groundwater pumping. NOAA Fisheries therefore strongly recommends including the monitoring of daily streamflow in San Jose Creek in the required monitoring program.

[4] E-mail Communication, Darby Fuerst, MPWMD, 9/28/2004.
[5] Personal Communication, CDFG, 11/5/04.

- **The County-imposed Conditions of Approval pertaining to road construction have not been adhered to and the resulting sedimentation is degrading aquatic habitat.**
    - Condition of Approval No. 18 requires the RSCP to implement the "Monterey County Erosion Control Ordinance Best Management Practices and minimize stormwater runoff. . . . [S]uch measures include using detention and/or percolation basins and/or using porous pavement or other permeable materials for roads and parking areas, or using infiltration of dry wells."
    - In a memo to the RSCP dated May 31, 2001, commenting on the proposed HCP, NOAA Fisheries made a similar recommendation. To date, NOAA Fisheries has not received any response from the RSCP on this recommendation.
    - A personal communication with the Granite Construction on-site RSC Supervising Engineer[6] verified our observation that no detention or percolation basins have been constructed. Drainage from impermeable surfaces is simply being channeled into the creeks. This practice is extremely short-sighted. The interception of surface flow from the hillsides by 130 miles of paved road, and the diversion of this intercepted water and water from the impermeable road surfaces into associated drainage ditches and channeling into the creeks, decreases groundwater recharge and increases peak flows in the creeks.
    - In addition to decreasing aquifer recharge, and thereby decreasing baseflow in the creeks, the increased peak flows destabilize the banks of the creeks, leading to further degradation of fisheries habitat through increased sediment delivery to the creeks. Increased sedimentation in creeks often results in the death of salmonid eggs and alevins, reduction or loss of salmonid food supply, loss of habitat quality and quantity, and direct harm to salmonids, all of which have been thoroughly documented in the scientific literature.
    - Balance Hydrologics' monitoring has documented a significant increase in the percentages of pool habitat covered by sand, as demonstrated in Figure 1 from the 2003 Steelhead Habitat Survey. In San Jose Creek, the percentages of pool bottoms covered with sand increased from 25% in 1998 to 60% in 2003. San Clemente Creek saw an increase in the percentages of pool bottoms covered with sand from 20% in 1998 to 50% in 2000.
    - A survey of the complete length of San Jose Creek in 2002 by NOAA Fisheries showed the tributaries flowing from the Preserve are delivering the bulk of the fine sediment contributing to the degradation of fisheries habitat in San Jose Creek. On a July 2001 tour of the Preserve, NOAA

[6] Personal Communication, Alex Mossman, Granite Construction, 08/02/04.

Fisheries staff[7] observed erosion problems resulting from road construction, which were severe enough to overwhelm the attempts at containment and were delivering significant amounts of fine sediments to Upper San Clemente Creek.

- **The mitigation program is inadequate to protect water-dependent aquatic species.**
  - As stated in written transmissions to the RSCP (NOAA Fisheries memo of May 31, 2001; NOAA Fisheries letter of 2/14/2002), NOAA Fisheries believes simply maintaining the October 1990 base flow levels, ***which were the lowest levels recorded after a multi-year drought***, is insufficient to protect listed steelhead and the habitat upon which they depend in the five steelhead streams on the Preserve. Summer rearing habitat for steelhead in the Carmel River Basin is a critical limiting factor in the persistence of a steelhead population in this area. To protect the limited summer rearing habitat available, management action should be tied to performance criteria that reflect the natural variability of water years. There should be a target range of baseflow levels and wetted channel lengths available to steelhead for each creek based on the type of water year. The FEIR and FSEIR thresholds for triggering mitigations require nothing more than maintaining summer creek flows at multi-year drought levels. This will dramatically reduce the number of juvenile steelhead that survive each summer. Low juvenile survival year after year is likely to lead to the demise of the steelhead populations in all five steelhead streams running through the Preserve. This is because the populations will not have enough members to survive the impacts of natural variability elsewhere in their life history cycle.
  - Mr. Joe Hayes, of Weber, Hayes and Associates, in a submittal on behalf of the RSCP for the September 29 Planning Commission hearing admonished the Planning Commission Members: "Don't forget the other mitigations in place." Unfortunately, 'the other mitigations' only apply to wells near 'protected base flow reaches'. 'Protected base flow reaches' were never clearly defined but vaguely described as areas that still had water during what probably were the lowest water levels of the 20th Century, after a four-year drought. Any areas outside or upstream of the 'protected base flow reaches' do not have any of the mitigations Mr. Hayes referenced.
  - Moreover, the 'other mitigations' are unlikely to adequately prevent impacts, even in the 'protected base flow reaches'. The 'other mitigations' stipulate aquifer drawn down shall not exceed one-foot along the 'protected base flow reaches' (Condition of Approval No. 13). It is not hard to imagine the effects of a one-foot drawdown on stream reaches which have an average summer depth of less than six inches. A one-foot

[7] NOAA Fisheries staff included Joyce Ambrosius, John McKeon, and Brian Cluer.

drawdown of the water table along the perennial reach of streams would seriously impact the availability of summer rearing habitat, decrease the wetted length of channel, dry up most riffle sections, and leave refuges in only the deeper pools, with little food production, increased water temperatures, and no way for fish to migrate to unimpacted areas. All of these conditions create increased risk of substantial injury or mortality to steelhead. These conditions have been documented by NOAA Fisheries and the MPWMD to be causing significant rates of mortality (NOAA Fisheries 2002; Pers. Comm. MPWMD, 11/19/2004).

- A more reasonable metric to protect steelhead habitat would be to limit aquifer drawdown to a maximum of one inch, thereby assuring suitable habitat persists during highly-stressful baseflow seasons. Monitoring wells and accurate stream gages would be needed to detect these changes in a timely manner. This restraint should be applied to all wells with potential hydraulic connections to streams.
- The 'protected base flow reaches' **do not** encompass the entire wetted stream habitat that was available to steelhead in 1990. As stated previously, of major concern to NOAA Fisheries is the definition of 'protected baseflow reaches'. NOAA Fisheries has recommended (memo May 31, 2001; letter 2/14/02) that 'protected baseflow reaches' be defined as areas accessible to steelhead that maintained perennial water throughout the summer of any of the monitoring years from 1990 to 2000, rather than the minimal flows and wetted channel accessible to steelhead as result of the prolonged drought that culminated in the October 1990 conditions.
- However, until an HCP is completed, no take of federally-protected steelhead is authorized and any harm to steelhead (i.e. streamflow reduction) is a violation of the ESA.

- **The monitoring program for detecting the effects of groundwater pumping on streamflows does not have clearly defined objectives.**
  - Testimony at the Monterey County Planning Commission hearings by consultants for the RSCP described the monitoring program as quite capable of detecting if streamflows declined to October 1990 levels based on "multiple lines of evidence"[8], meaning comparison with the 1990 extent of available habitat, comparison with the 1990 water quality data, and comparison with flows in other watersheds Putting aside the issue of setting the trigger for mitigation at record drought levels, this assertion is quite disingenuous. The Balance Hydrologics report describing October 1990 stream conditions for Las Garzas Creek within the Preserve states: "the wetted channel on Lower Las Garzas Creek during fall 1990 was limited to pools below boulder steps through the lower 500 meters of the stream within Rancho San Carlos."

[8] August 25, 2004, Planning Commission testimony of Mark Woyshner, Balance Hydrologics.

- The August 3, 2004, survey of this reach by Balance Hydrologics, the RSCP, and the MPWMD staff found only 836 feet (253 meters) of continuous flow within this reach.[9] However, because the multiple lines of evidence were not all in alignment with finding 2004 levels lower than 1990 levels (apparently the 1990 survey had a water quality measurement of higher specific conductivity than any water quality measurements taken in 2004)[10] , this single quantitative measure of the monitoring program, and fundamental measure of aquatic habitat, was rejected and mitigation measures to restore streamflow were not implemented. The explanation given by the RSCP monitoring staff was that the original 1990 survey probably did not make an accurate measurement of this section of the conditions in the creek.[11]
- In reviewing the monitoring program proposed for the HCP, NOAA Fisheries determined the monitoring program required by the County, and as carried out by the RSCP, is primarily subjective. The program is dependent upon the evaluation of conditions that are open to subjective, thus potentially vastly differing, interpretation as in the example above. Staff from the MPWMD who have participated in the monitoring surveys have confirmed our determination that the program is primarily subjective and open to interpretation. The MPWMD staff were not comfortable with the methods and felt the simple classification of the channel as wet, dry, predominantly wet, or predominantly dry, were in many instances arguable calls, thus a very subjective evaluation of conditions.[12]
- Because no pre-project quantitative data (i.e. streamflows) are available [as a result of the RSCP's failure to install stream gages until project well pumping had occurred for several years], there is nothing to guide these otherwise subjective interpretations of the monitoring program.
- To correct this fundamental flaw in the County-required monitoring program, NOAA Fisheries recommended the HCP monitoring program reports include measurements of the length of channel available to rearing steelhead, which is a direct and quantitative measure of the success of habitat protection measures (NOAA Fisheries letter to Don Wilcoxon, 2/14/2002). To date, the RSCP has ignored this recommendation. A fundamental measure of habitat quantity available to steelhead for summer rearing is the length of the wetted channel in the perennial reaches of the creeks that flow through the Preserve. The length of wetted channel is directly correlated with the amount of existing baseflow.[13]
- It appears the information on Las Garzas Creek regarding October 1990 levels is limited and subject to interpretation (and revision). However, this information is far more extensive than the information available for the

[9] Personal Communication, MPWMD, 11/19/04.
[10] Personal Communication, MPWMD, 11/19/04.
[11] Personal Communication, Mark Woyshner, Balance Hydrologics 11/19/04.
[12] Personal Communication, MPWMD, 11/19/04.
[13] Personal Communication, Barry Hecht, Balance Hydrologics, 2002.

other creeks that flow through the Preserve. Thus, the October 1990 conditions in the other creeks are essentially undocumented, with the potential for an even greater degree of subjective interpretation of monitoring results and the development of erroneous conclusions.

- **The County imposed monitoring program required comparison with flows in other watersheds. The RSCP assertions at Monterey County Planning Commission hearings, that similarities in the recession of summer flows between Pine Creek and Las Garzas Creek prove ground water extraction is not affecting the summer baseflow of the Preserve's steelhead streams, is an assertion based on faulty assumptions and incomplete information**.
    - Pine Creek and Las Garzas Creek cannot be directly compared without taking into account differences in watershed size, topography, geology, precipitation intensity, rainfall patterns, seasonal differences in runoff patterns, percolation rates, and storativity values.
    - Consultants for the RSCP testified at the August 25, 2004, Planning Commission hearing that "in general we see more water in Pine Creek."[14] This statement is not borne out by records. The Pine Creek watershed may receive fractionally more rainfall than Las Garzas because of its higher elevation. However, the watershed area of Las Garzas Creek is approximately double that of Pine Creek (13.2 square miles vs. 7.8), and from 1992 to 1995 the Las Garzas watershed yielded approximately 2000 more acre-feet of surface runoff (MPWMD 1996).
    - Moreover, the extremely steep topography of virtually the entire Pine Creek watershed (*see* Plate 3), in addition to the higher intensity of rainfall, would indicate a higher percentage of precipitation results in surface runoff. By contrast, the broad valleys and rolling hills of the upper Las Garzas watershed (*see* Plate 4), which drain into the alluvial aquifer of the San Francisquito Flat, would indicate a higher percentage of precipitation in the Las Garzas watershed percolates into the ground, recharging the aquifer and, previous to development, would have supplied significantly greater summer baseflows in Las Garzas Creek as compared to Pine Creek.
    - The Las Garzas Creek streamflow evaluation (CDM 2003, in Fugro 2003) contains valuable new information, but this information is not presented openly or accurately in the FSEIR. Figure 5 in CDM 2003 shows important differences in the hydrographs for Pine Creek and Las Garzas Creek for June 2001. Four days of rising flow in Las Garzas Creek was compared to four days of flattening of the recession curve in Pine Creek and "attributed to a lack of precision in the Pine Creek streamflow data" [Fugro 2003, page 4 Appendix B]. Later in June, a slight rise in Pine Creek flow was <u>*not*</u> compared to the corresponding flattening of the Las Garzas Creek flow. Because well E-3, a shallow alluvial well located

[14] Testimony of Polly Bousevain, Camp Dresser & McKee.

adjacent to Las Garzas Creek, where "it appears possible to discern the effects of pumping", was pumping during June 2001, a simpler and more plausible explanation is that both of the June 2001 deviations from the recession trend were caused by changes in weather and by the pumping schedule of well E-3 and its effects on the Las Garzas Creek hydrograph.

- Precipitation and streamflow trends were evaluated for Las Garzas and Pine Creek (CDM 2003 in Fugro 2003). Table 2 [CDM 2003, pg. 5] lists May through September streamflows for Las Garzas and Pine Creek, and rainfall accumulated at San Clemente Dam from December through May for corresponding years. The list is ranked from highest to lowest rainfall. The rainfall-streamflow relationship for Las Garzas Creek was plotted [CDM, Figure 8] and a regression pattern determined. NOAA Fisheries plotted the same data (Figure 3) and found the Las Garzas Creek flow was not linearly related to rainfall (indicating a weak statistical correlation), while Pine Creek flow was related linearly to rainfall, with an R^2 value of 0.8 (indicating a strong statistical correlation). The most plausible explanations for this fundamental difference are the interception of Las Garzas Creek streamflow by well production and the operation of Moore's Lake, which CDM failed to mention.
- Similarly, we examined the yields of both creeks for the late season using data from Table 2 (CDM 2003) and found Pine Creek yielded 7412 acre-feet between 1992 and 2002, while Las Garzas Creek yielded only 4268 acre-feet. CDM 2003 attributes the difference to Pine Creek being "at a higher elevation and very likely receives more rainfall" [CDM 2003 pg. 4]. This explanation is incomplete for several reasons. The Las Garzas Creek watershed is 13.2 square miles, while the Pine Creek watershed is 7.8 square miles. The MPWMD (1996) found that Las Garzas Creek produced 8.1% of the tributary flow to the Carmel River over the period 1992 to1995, and Pine Creek produced 7.5% of the tributary flow. Pine Creek is geomorphically distinct from Las Garzas Creek, which is likely to make Pine Creek drier in the summer. Pine Creek flows in a deep mountain valley with insignificant alluvial deposits along its length from the headwaters to its confluence with the Carmel River. Conversely, Las Garzas Creek has the structural depression, large alluvial basin, and wetland around Moore's Lake (San Francisquito Flat) to have supplied perennial flow downstream in the absence of the Preserve's water development.

- **Conclusions**
  - With respect to water development on the Preserve, the FEIR and FSEIR claims of negligible and fully mitigated environmental impacts are based on two critical assertions: Impacts will be spread out over vast acreages and *all* aquatic impacts will be deferred to the wet season. NOAA Fisheries cannot accept these assertions because they are unsubstantiated by any credible analyses, are based on an invalid conceptual model that

does not reflect the known geophysical conditions of the Preserve, and are contra-indicated by the data collected to date. Additionally, these two assertions are internally inconsistent. Assuming impacts will be spread out over vast acreages implies the realization of effects will be a year-long and gradual process, while the deferment of all impacts to the wet season requires us to believe impacts will be limited to a few months of the year and focused into a single season when relatively large streamflows exist.

- Good monitoring data are critical to confidently assess impacts and effects. Current data are inadequate to assess the impacts of well pumping on streamflows in the creeks that flow through the Preserve. A long-term data collection and monitoring strategy must be developed through a data quality objective process and be explicitly defined to ensure collection of the data needed for accurate analysis and resource management.
- Considering the value of the natural resources at risk, and the sizeable risk to water resources development on the Preserve, the development of an integrated analysis using a two or three dimensional time-dependent numerical computer model is warranted. Without this type of analysis, based on a revised and valid conceptual model equivalent to the local watersheds' fractured rock and perched alluvial aquifers contributing to streamflow and Preserve groundwater extractions, it is impossible to accurately calculate the magnitude, distribution, and timing of the effects of well pumping on the Preserve.

Table 1. Distance from Rancho San Carlos wells to nearest stream, determined from GIS.

Well ID	Distance to Nearest Stream (ft)	Well ID	Distance to Nearest Stream (ft)
E1	388	R29	1065
E3	102	R29A	1077
E4	2087	R3	670
E5	140	R33	461
N1	1810	R42	381
N10	1218	R5	586
N11	1259	R6	1214
N13	1890	R9	1017
N14	1349	S1	282
N16	349	S3	301
N17	150	S4	688
N18	808	S5	985
N19	1756	S6	230
N2	1824	T10	2297
N21	605	T11	59
N22	403	T12	1556
N24	252	T14	99
N26	1136	T17	1609
N27	1052	T17A	1590
N28	1165	T18	1512
N3	1380	T18A	1512
N30	1990	T20	144
N31	1042	T21	1593
N4	354	T24	1922
N41	1011	T25	2880
N5	234	T26	327
N6	1096	T26A	320
N7	496	T29	1065
N8	824	T29A	1065
N9	1334	T3	1046
R1	1521	T4	570
R10	420	T6	491
R11	1476	T6A	435
R13	123	T7	339
R14	1095	T8	397
R15	2437	T9	1022
R27	1286	T9A	1022

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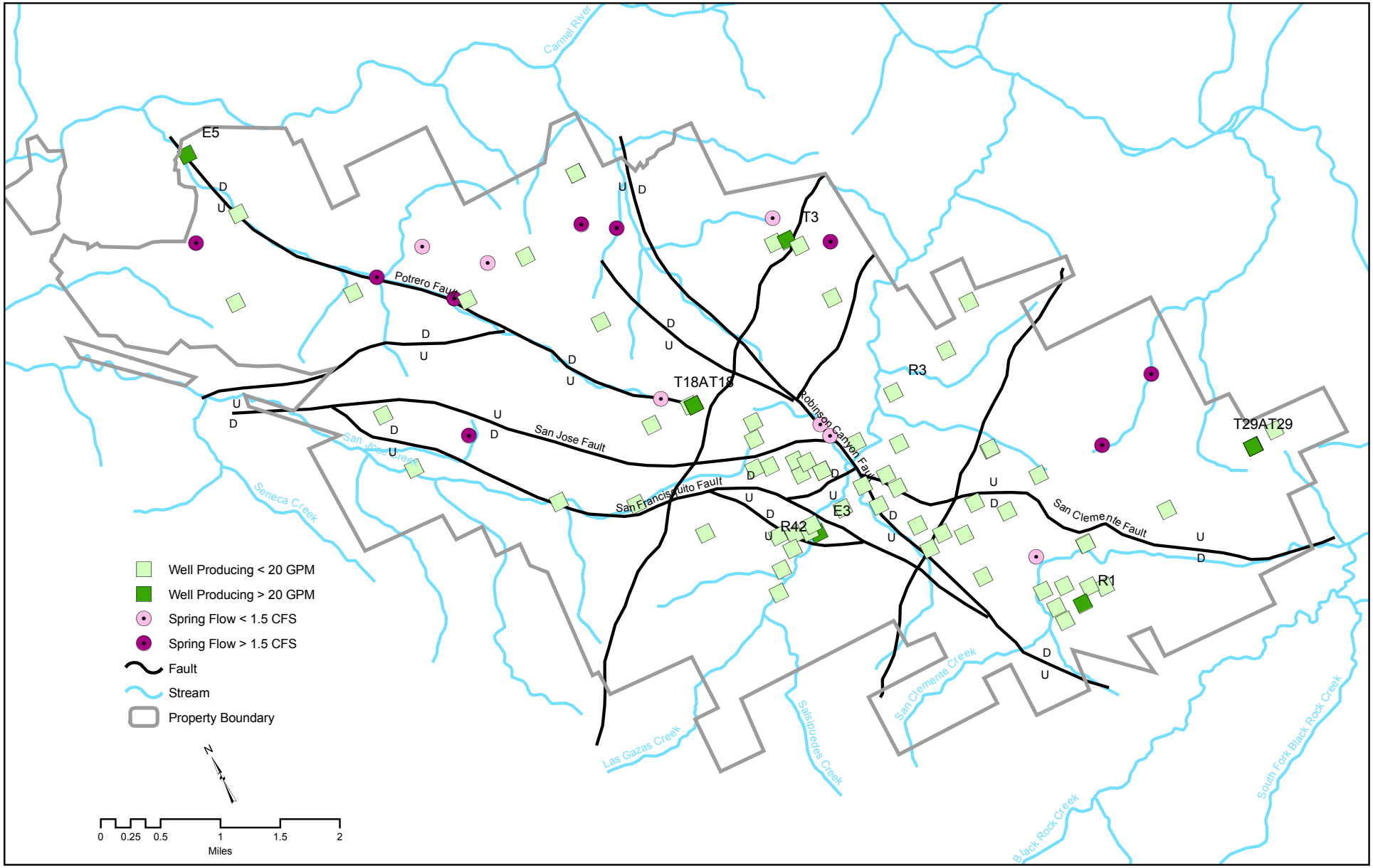

Plate 1. Location of fault lines, wells, springs, and streams; Rancho San Carlos, Monterey County, CA. Many wells and springs are located along faults, as are significant lengths of the streams. Data are from CHS 1994.

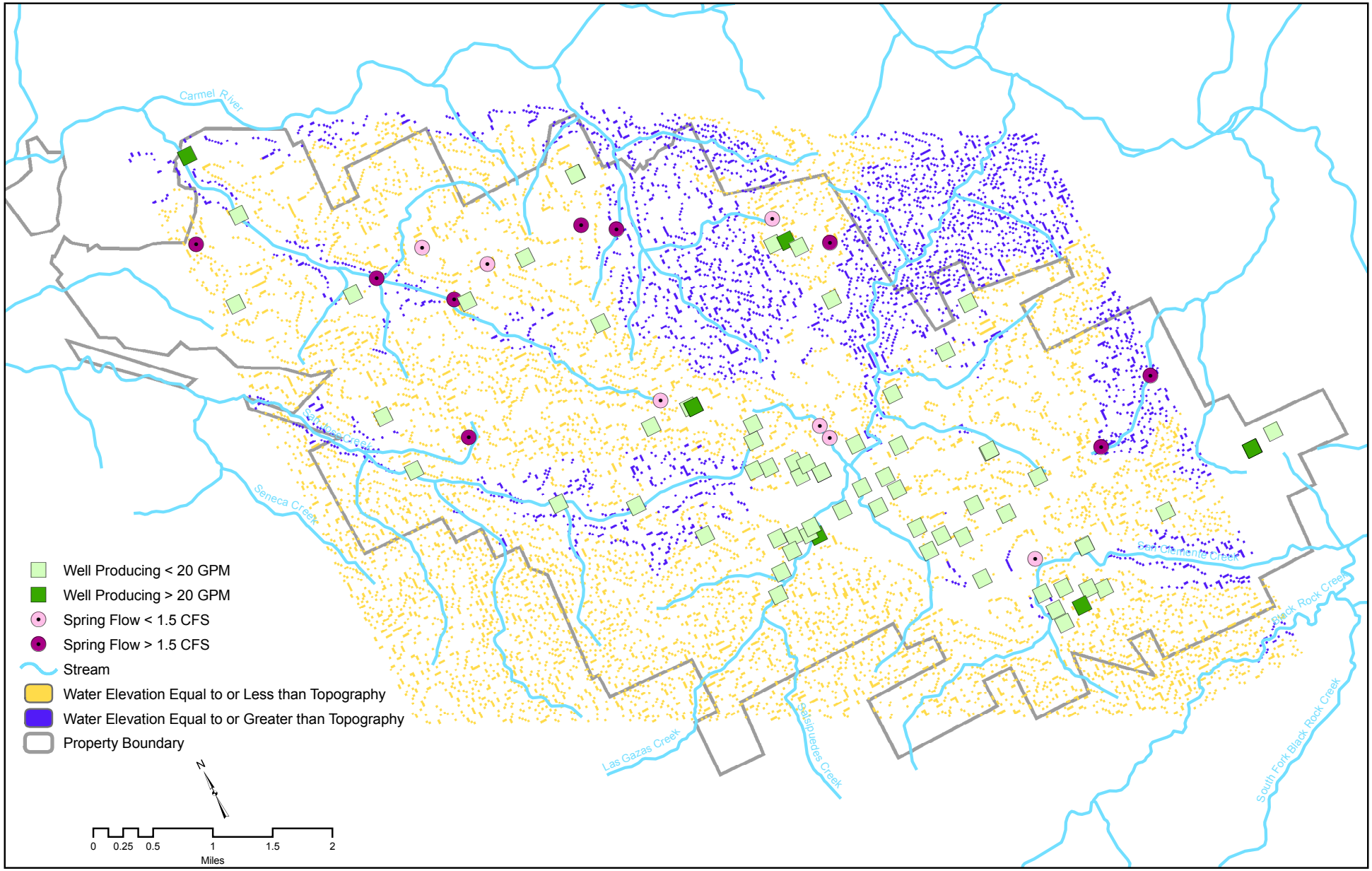

Plate 2. Depiction of the water table's relation to topography, Rancho San Carlos, Monterey County, CA. Analysis completed by intersecting 50 meter land topography contours with interpolated contours of well elevation. The first water surface elevation reported after well completion was selected from Table F-1, CHS 1994. Blue zones are areas where the water table is expected to connect with land surface; a reasonable approximation of stream base flow reaches. Springs also plot reasonable close to the intersection of the water table and land.

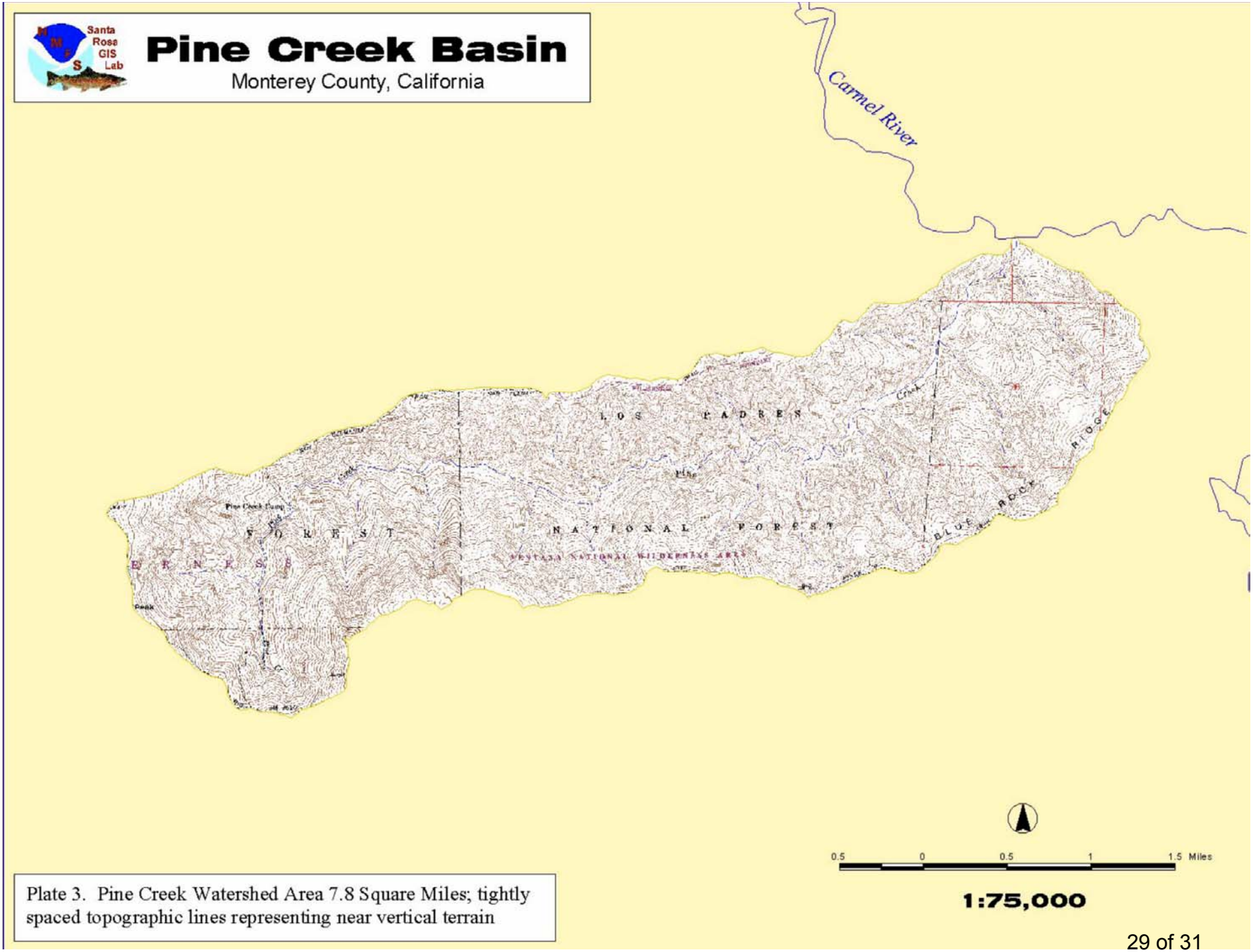

Plate 3. Pine Creek Watershed Area 7.8 Square Miles; tightly spaced topographic lines representing near vertical terrain

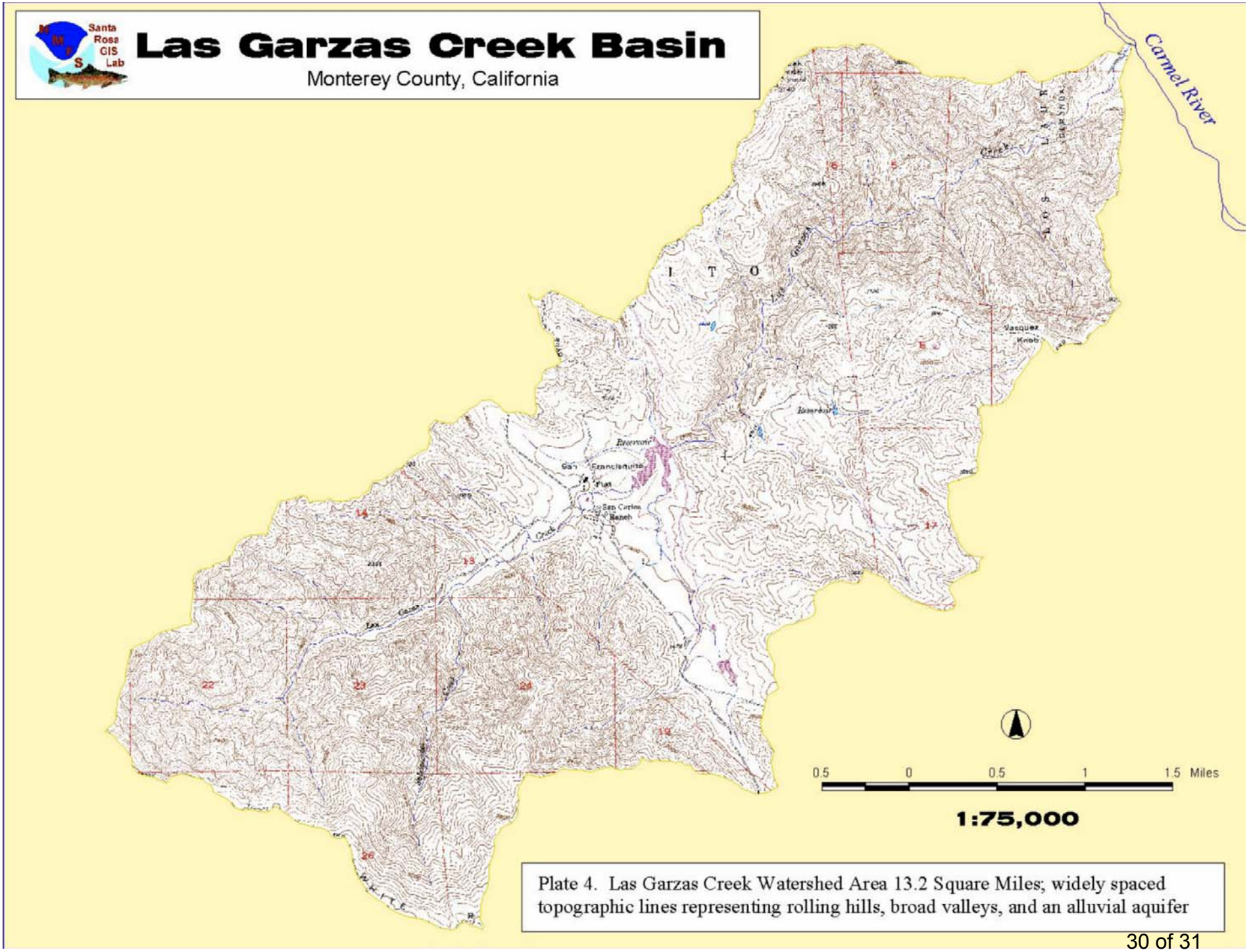

Plate 4. Las Garzas Creek Watershed Area 13.2 Square Miles; widely spaced topographic lines representing rolling hills, broad valleys, and an alluvial aquifer

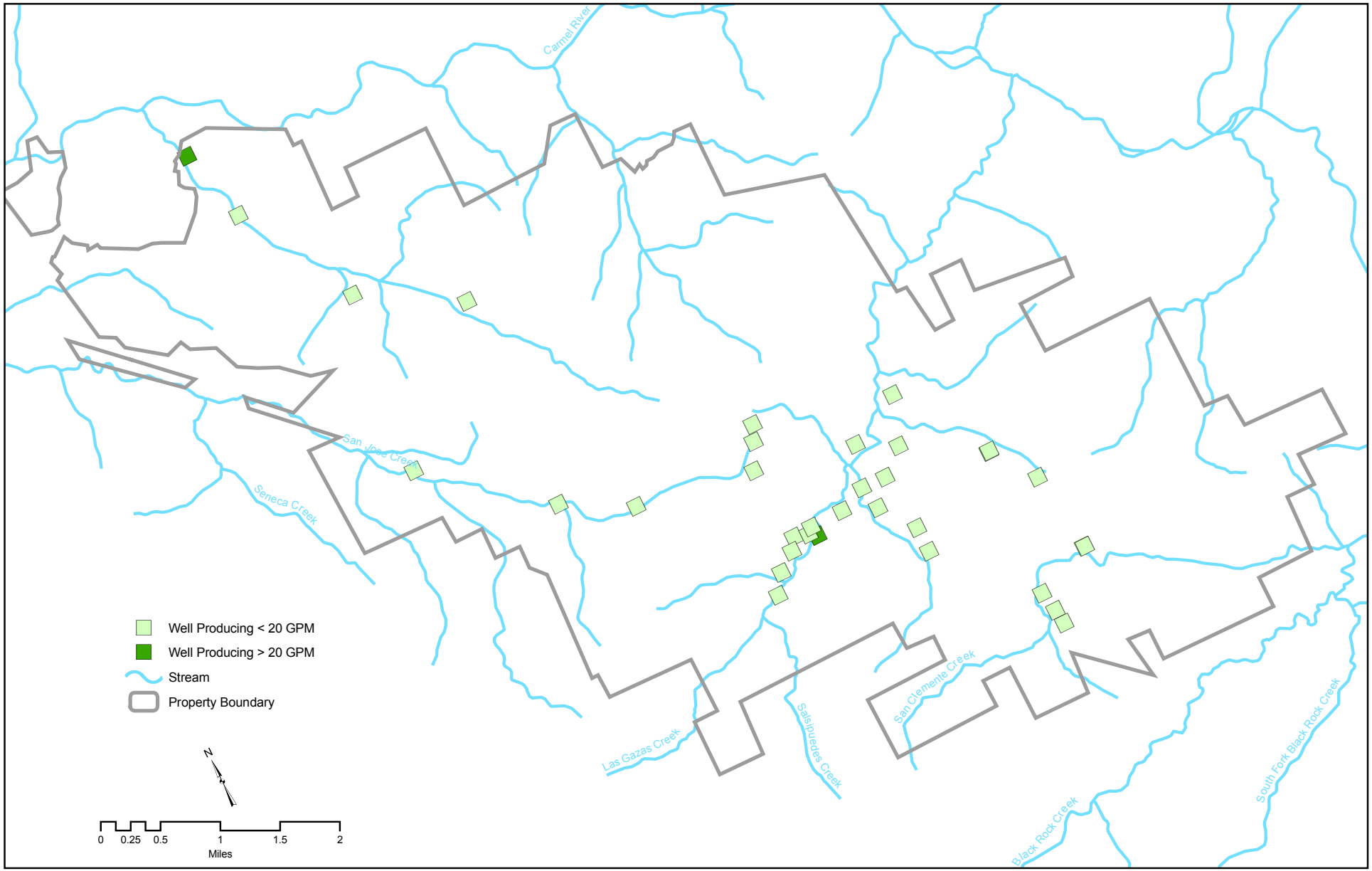

Plate 5. Map showing the linear proximity between ground water wells and streams, Rancho San Carlos, Monterey County, CA. Wells shown are within 1000 feet of streams.